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ABSTRACT

Scenarios depicting both positive and negative alternative futures were prepared to serve as a source of ideas in this study of ways to improve education with less money. Included in this third volume are (1) a disaster scenario based on piecemeal, reactive solutions; (2) a scenario based on applications of "big media"; (3) a scenario based on individualized instruction using "little media"; (4) a disaster scenario based on applying instructional hardware without adequate planning; and (5) a "success" scenario based on rational problem solving and the design processes of technology. Scenario preparation led to the identification of questions which should be addressed: Can higher education be made efficient and effective without a reassessment of its goals? Can higher education be improved if it is viewed as a teaching process? How can we determine whether higher education is as effective as it should be? Is it possible to bring about change in higher education? Parameters which can be varied to alter costs were also identified. The first report in this series of three consists of a literature review of the costs and effectiveness of educational technology, and the second presents five scenarios of alternative futures in grades K-12. (Author/RAO)

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Educational Technology and Cost Reduction in Higher Education:

Five Alternative Futures

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STAR Project
No. 76-2061

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PREFACE

The contents of this report are intended for individuals who are interested in maintaining the viability of higher education in Florida and ensuring its future effectiveness and success. In the most general terms, our target audiences would include policy makers, decision makers, practitioners, and anyone else who has a direct stake in the operation of our colleges and universities. In more specific terms, policy makers would include state legislators, members of the Board of Regents, their staff, and university presidents--all of whom will be faced with the difficult task of making ends meet as our colleges and universities move through each annual financial cycle.

Another important audience is made up of advocates for higher education--whether they be professional lobbyists or concerned parents. May they find the cost analyses and alternative solution possibilities a source of ideas for mounting influence campaigns to make the college campus an optimal learning environment. And lest we forget, there are the faculty members and academic administrators who make learning happen on a day-to-day basis. May each of these audiences find ideas that will stimulate and increase the effectiveness of their problem solving efforts as we move into a clouded and stormy future.

A Gloomy Financial Future for Education

The financing of education in Florida over the next ten years appears to be uncertain. If present cost trends continue, public education will require 86% of Florida's General Revenue Fund (GRF) by 1985 if no new sources of tax revenue are found; education's present share of general revenue funds is presently approximately 60% (1).* The 1977 Florida legislature took a conservative approach toward raising taxes to provide additional state revenue. Although some new taxes were approved, they will produce less revenue than the amount required in the governor's budget request or that desired by educators in general. It seems clear that the public, through its elected representatives, is reluctant to dig much deeper to fund education at the level to which it has become accustomed during the previous two decades.

The problem of financing education is not isolated to Florida. For example, Robert McBride (2) reports an analysis of the national educational picture which is very similar to Florida's situation. He points out that the fraction of Gross National Product (GNP) allocated to education has doubled in the past 25 years and now comprises from 7.5% to 8% of the total. By 1980-81, McBride estimates that there will be a deficiency of about $15 billion dollars between revenues and educational expenditures at the national level. It seems clear that this gloomy financial picture is not the figment of some isolated economist's imagination. The data can be replicated at both local and national levels!

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this preface.

So the game of "hounds and hares" is on--expenditure requirements speed ahead steadily each year while the public very reluctantly generates just enough revenue to barely keep up minimum levels of service. But which is the "hound" and which is the "hare"? The only thing that seems clear is that both are becoming leaner and leaner as they race into an uncertain future.

Given the larger picture, questions can be raised as to whether or not economic growth can ever again generate enough resources to bring education funding to levels that we knew back in the "good old days" of the 1950's and 1960's. The 1977 Florida legislature's reluctance to increase taxes any more than it did may well be prophetic of the future over the next ten to twenty years. If it is, then educators will not be able to rely on increased funding to balance university budgets which continue to rise through inflation, higher costs for energy, increases for teachers' salaries, as well as for increases in all other categories of expenditure. In addition, taxpayers are questioning whether they and their children are obtaining a fair return on their investment in education; completion of college no longer guarantees access to an occupation of one's choice as jobs become harder and harder to find.

The present game of "hounds" and "hares" is unlikely to change in the near future. If present trends continue, the Florida legislature will continue to be reluctant to vote new taxes to pay for an ever expanding state budget. If this is true, then about the best we can expect is a modest tax increase only whenever it appears absolutely necessary. As a result, colleges and universities will have to rely more and more on their own ingenuity to overcome impending deficits or else make drastic cuts in expenditures to live within the means provided by state revenues and funds from federal sources. This is by way of saying that it looks as though there will be few, if any, ways to get out of the present financial bind through the hope of increased state funding. It seems more likely that higher education will be expected to do as well, if not better, for less money. If this assumption is true, and there are projections to support it, what can colleges and universities do to work through this financial bind and come out as stronger and even more viable educational institutions?

Purpose of This Report

In this report we will address the problem of providing better education for less money. Some may scoff and conclude that such a prospect is not possible. Under present operating assumptions that may well be true. However, suppose that some of our most cherished operating assumptions--e.g., students must be taught by a "live" teacher, a college degree requires four years of study, students must live in residence on campus, grades should be based on a "curve"--were changed?

What would education look like then? Would operating colleges and universities cost less? And more importantly, would such an education produce as much student learning as we think is desirable?

The purpose of this report, then, is to present alternative futures of what higher education in Florida might look like under different sets of assumptions and to describe what role educational technology might play in providing effective education at less cost. The means for exploring these alternative futures is through the technique of scenario writing.

Scenario writing is a tool which is being utilized more and more frequently by planners concerned with problems of the future. As Spitzer points out, scenario writing is a method for developing future thinking which attempts to unify the often discrete ideas and predictions generated by other methods such as brainstorming or the Delphi technique (3). Spitzer also strongly urges the institutionalization of future thinking for planning and decision making in the present. Thus, he sees scenario writing as a method of planning educational change which attempts to avoid haphazard solutions which often occur in reaction to salient external forces.

Although there is a great deal of fiction* in scenario writing, the fiction is based on research and expert opinion. Lest the reader assume that we have let our imaginations run unbridled by reality and fact in creating the scenarios, we wish to point out that each author has researched each solution and solution strategy to estimate as closely as possible required levels of costs and expected levels of effectiveness. A list of references which documents projections can be found at the end of each scenario chapter.

Overview of Chapters in this Report

This report has been written to serve as a source of ideas. Readers are therefore encouraged to sample from the chapters rather than to begin on page 1 and read page-by-page to the end. A brief overview of each chapter is given below to assist you in familiarizing yourself with the content of this document so that you can make choices more closely related to your interests and to access information in an efficient manner.

Chapter 1 - Expenditures for Higher Education in Florida. This chapter presents an analysis of expenditures in higher education. It provides an idea of the total amount of expenditures, various categories of expenditures, and varying categories of instruction.

Student enrollment in higher education is projected to increase by 1985: community colleges, 73%, and the State University System, 41%.

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*Any resemblance between the fictional characters or places in the scenarios and actual persons or places is purely accidental.

Due to these projections, a "cost cutting" goal for higher education could be to maintain current funding levels while absorbing the increased enrollments. The largest category of expenditure is for instruction. Therefore, cost savings can be obtained through limitations in faculty growth.

Chapter 2 - Disaster in Florida's Higher Education System, 1985: A Scenario. This chapter contains a description of one possible future for higher education in Florida. It is a disastrous future which could evolve as a result of fiscal crises.

The disaster described in this scenario parallels the CUNY situation in 1975. Major features of the disaster include: (a) college and university closings in the middle of the academic year, (b) massive faculty layoffs, (c) radical tuition increases, and (d) heavy litigation against the state for breech of contract with students and faculty.

Factors which are portrayed as contributing to this fiscal crisis include: open admissions, level of instate tuition, collective bargaining, state aid to private institutions, and competition versus cooperation. Higher education issues which are discussed include: (a) litigation for failure to deliver skills as promised, (b) market glut of people with higher education degrees, (c) reverses in predictions for enrollment increases, (d) interactions of efficiency and effectiveness, and (e) increases in required teaching loads with subsequent decreases in research and generation of funding.

Chapter 3 - Scenario of a Supplement to the Report of the Commissioner of Education, 1985-86. This chapter explores what higher education would be like if "big media" such as instructional television and computer-assisted instruction were adopted as means for reducing educational costs. It is based on the assumption that the traditional instructional system must be revamped to increase educational efficiency and effectiveness.

Use of "big media" represents one means of switching from a labor intensive to a capital intensive method of instructional delivery. The proposed system incorporates ITV and CAI on a large scale basis which makes use of economies of scale. In addition to CAI, other areas of computer usage for higher education which are discussed include: library information retrieval, research applications, data processing education, problem solving, simulation, computer managed instruction, and testing.

Chapter 4 - A Cost Reduction Plan: Personalized, Multi-Mode, Competency-Based Degree Programs, A Scenario. Written in the form of a magazine article for Better Schools Magazine this scenario describes how the use of "little media" (i.e., film strip projectors, audiotape recorders, programmed instruction, etc.) can be integrated with individualized instruction to increase learning effectiveness while decreasing costs. The cost reduction mechanisms on which this scenario is based include: reduction in faculty, elimination of small class offerings, and reduction in student time.

This scenario also demonstrates the key role which "soft technology" (i.e., problem-solving and design processes) plays in selecting and coordinating the methods and means required to bring about better schools for less money. Shifting from a teaching- to a learning-outcome orientation is identified as a basic requirement for achieving a cost-effective educational system. The scenario closes with a series of interview conversations. These conversational "vignettes" describe what life is like under the new educational system and how it is viewed by students and faculty who have experienced it.

Chapter 5 - Florida's Experience with Emerging Technologies in Higher Education, European Economic Council Report #529-4827-4211: A Scenario, 1990. Written in the form of a report to the department of education of the European Economic Council, this scenario demonstrates that attempts to solve financial problems through use of instructional hardware will not necessarily be successful.

The scenario describes one plan for using emerging technologies to achieve cost reduction and analyzes reasons for failure of the plan. Parallels are drawn to the experiences in development of Florida Atlantic University. Issues which are discussed include: developmental cost for software, capital outlay for hardware, attitudes toward change, and replacement versus add-on functions. The scenario concludes with an analysis of ways in which the failure could have been averted.

Chapter 6 - Educational Malpractice Suit in Florida's Higher Education System: A Scenario, 1982. This scenario written in the form of two articles in the Higher Education Ledger describes a court action about higher education. The case in question revolves around the issue: Is there an implied contract of usability and suitability for the "product", higher education?

The first article describes the trial. Evidence presented at the trial dealt with decline in test scores, technological applications, instructional technology, resistance to change, and quality in education. One witness testified at length on the innovative experience of one university.

The second article discusses the court's decision. The court in finding for the plaintiff noted that there is an implied warranty in any set of goods and services. In addition, the court charged the state to begin a program to redress the educational situation.

Chapter 7 - Increasing Efficiency and Effectiveness: Some Questions to be Asked. This is not a scenario but rather a discussion of some critical questions educators must ask themselves if they are to deal successfully with the impending financial crisis in higher education. Responding to these questions should help in the identification of underlying assumptions which may be overlooked but which have a significant impact on future efficiency and effectiveness.

The first area to be considered is where we now stand in higher education. Public dissatisfaction, with end products and legislative resistance to increase funding levels are examples of the climate in which colleges and universities operate.

How much and what kind of higher education society can afford is also an important issue. Availability of funds depends in part upon priorities placed on higher education and other public services such as health care, housing, transportation, and energy. The economic arguments for the priority traditionally assigned higher education seems less valid today than at any time in our history. Unless higher education comes to be valued for other than reasons of economic benefit, it may not survive in its present form in the future.

One of the most difficult issues to be considered concerns whether the nature of the impending crisis is related to higher education's efficiency or to its effectiveness. It is suggested that the concepts are highly related. Increasing efficiency requires that qualitative value of output (effectiveness) remains, improves, or does not drop below some specified level. Planning and change strategies that concentrate exclusively on finding cheaper ways to do the same old things without regard for effectiveness may lead educators into making some Faustian "bargains" they will later regret.

Improving effectiveness will require a critical examination of goals and objectives. It is suggested that an external type needs assessment has potential value for identifying goals and setting priorities among them.

Implementing solution strategies in higher education has always been a difficult process. It is suggested that participation of all partners in the higher education enterprise (i.e., students, faculty, administrators, taxpayers, legislators) will be required for success. The kinds of changes discussed in the scenarios in this report may require a shift in the roles traditionally played by faculty. Support in terms of released time, materials, and feedback will be required in order to make the transition.

The final area considered concerns the tendency for participants in higher education to believe they can stand aloof from political life. However, it is becoming increasingly clear that important decisions about the future of higher education will be made within the political process. We must either learn to pursue our interests through the give-and-take of the political process or take the consequences of reduced funding and policies that inhibit or prevent effective and efficient operation.

Chapter 8 - Some Approaches to Reducing the Costs of Higher Education. This chapter presents and discusses the conceptual framework which was used to plan the various cost reduction strategies in Chapters 3, 4, and 6. The model is based on the assumption that effectiveness, efficiency, and cost are inextricably interwoven. A rationale is presented for this position and concern expressed about addressing issues of efficiency without consideration of effectiveness.

Potential manipulations which can reduce costs are identified and discussed. They include: substitute low-cost labor for high-cost labor, increase intensity of labor usage, substitute student initiative for faculty supervision, substitute capital for labor, intensify utilization of capital, change curricular mix, reduce expenditures for non-instructional services, spread overhead costs, reduce proliferation of courses, reduce faculty salaries. Issues related to effectiveness (e.g., measurement of output) are also discussed.

Epilogue. Each of the preceding chapters has discussed aspects of the problem of achieving better colleges and universities for less money as well as exploring the potential consequences of relying on piecemeal solutions. As the concluding portion of this report, the epilogue summarizes what the authors believe to be the key points that must be addressed if we are to succeed in achieving better higher education for less money.

The most critical issue is the need to reassess present curriculum goals and objectives. If this can be accomplished, then we must be able to create incentives that will motivate educators to change present methods and means in order to increase learner performance. One of the major barriers that must be confronted is to turn colleges and universities from being "budget-driven" to "learner-driven" organizations. A shift from "budget performance" to "learner performance" would set the stage for managing for results thereby enabling increased effectiveness and efficiency.

The functions that educational technology should perform are considered and conditions for obtaining maximum benefits from educational technology are summarized. These conditions include: creating an effective planning capability (something which colleges and universities presently lack); creating an effective management capability (something which colleges and universities must learn to do better); creating an effective means for monitoring the effectiveness and efficiency of instructional programs (something which we are only beginning to learn how to do); and shifting our emphasis form focusing on instructional processes to focusing on learning outcomes (i.e., adopting a learner performance orientation).

Careful distinctions are made between technology as a problem solving and design process and technology as hardware applications. The epilogue closes with the conclusion that the problem solving and design processes of educational technology provide a more useful means for achieving more effective and efficient higher education than do technological applications in the form of hardware-based instructional delivery systems.

Appendix - An Economic Model for Resource Allocation in Education. This appendix gives an economic basis and rationale for a change of process in education. Production functions are discussed--the relationship between various inputs and maximum quantities of output is described graphically. Issues which are discussed include: economies of scale, individual production functions, and multiple outputs. In addition, the implications of these analyses for measurement of outcomes are addressed.

Myths about Educational Technology

As mentioned earlier, one of the purposes of this report is to explore what roles educational technology could play in providing better education for less money. A caveat is in order before proceeding further. It deals with misperceptions commonly held about the concept of educational technology.

The most common misperception is that educational technology should be equated with "things" such as computers and computer terminals, television receivers and transmitters, radios, movie projectors, and all of the many other kinds of instructional media devices that the public has seen or read about. These "things", however, are only a small part of the larger, more generic, concept of educational technology. The larger and more significant part of the concept has to do with the problem solving and design processes that must precede the "things." Few if any technological applications--no matter how simple or complex--could be productive without prior activity devoted to identifying the purpose to be achieved and then designing both processes and "things" to achieve that purpose.

Moving back to an instructional context, the "things" of instructional media are little more than gadgets if there is no lesson to communicate. And the lessons to be "taught" must also be carefully designed and developed to achieve the purposes which should have been identified at the outset. In light of these relationships, we take great care to distinguish between the terms educational technology and technological application.

Educational technology, as we will use it, refers to:

- The identification of educational goals and objectives and the design of methods and means to achieve them.

We shall use the term technological application to refer to:

- The hardware and other means that are inserted into the educational process to achieve desired ends.

Thus, examples of technological applications (or hard technology) would include: instructional television; computers; moving picture projectors; tape recorders; programmed instruction; and other examples of instructional media.

Why all the fuss about the distinction between educational technology and technological applications? The most basic reason is that educational technology (or soft technology) as a problem solving and design process seems to hold a greater potential for achieving better education for less money. Technological applications, on the other hand, may serve as a substitute for the human teacher; but we can find little or no evidence that such hardware substitutes can actually reduce costs in and of themselves (4). Therefore, if educational technology is equated with hardware applications, it gives us only a limited set of alternatives which may not even include the most effective ones for identifying the problems let alone solving them.

It has been a sobering experience to review the literature on the costs and effectiveness of technological applications. Our review (4) did not lead us to the panacea which "technology" has been alleged to be for increasing productivity in other sectors of the American economy. The failure to find a panacea may actually be a blessing in disguise. It has required us, and others, to probe more deeply in an effort to determine the underlying problems rather than continuing to work under the assumption that our colleges and universities are "OK" and all that is required is to discover the "right" solution to make them more efficient.

Our Goal: To Reduce Costs while Maintaining Present Effectiveness

As you read each of the alternative futures which have been depicted, you may find some of the scenarios more appealing than others. On the other hand, you may find that none include the "happy ending" that you and others may wish for higher education. Still others may fault us for not portraying more "creative" applications of the latest developments in instructional media such as communications satellites and sophisticated combinations of instructional hardware such as multimedia carrels equipped with videodisc players, micro computers, and other exotic hardware being projected for the future. To such criticisms we can only say that we set out to reduce costs, not to increase them.

Come with us now to see what the future of higher education might look like in Florida within the next ten years.

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Chapter 1

EXPENDITURES FOR HIGHER EDUCATION IN FLORIDA

by

Craig Hewitt

Introduction

The purpose of this chapter is to document the expenditures for Higher Education in Florida, especially expenditures from the General Revenue Fund (GRF). Approximately 28% (or $396 million) of the GRF spent for public education went to Higher Education in 1974-75. This figure is expected to rise 61% by 1985 (1).*

Florida's higher education system is composed of two divisions. One is the State University System (SUS) which consists of nine universities throughout the state. The second division is made up of twenty-eight Community Colleges (CC). The purpose of the community colleges is to make educational opportunities available within commuting distance of all citizens of Florida. Their level of instruction is below the junior level of the university programs (2).

In 1974-75 the General Revenue Fund (GRF) provided $141 million (1) for Community College programs. The GRF provided $254 million for the SUS. Expenditures for the CC's are expected to increase by 92% between 1974 and 1985 (1). For the same period in the SUS required expenditures are expected to rise 42% (1) (see Figure 1). These increases will be caused by an increased adult population in Florida, expanded programs due to increased demand, and an increase in the expenditure per student.

In the following two sections enrollments and expenditures from the GRF will be analyzed for the community college system and the state university system. All together, there are 37 institutions of higher education (IHE) supported by the state of Florida.

Costs as given are accounting costs, i.e. what the actual dollar expenditures were.** The economist's "opportunity cost" is not included in this chapter since it would be more appropriate in a "needs assessment" study.

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

**Cost data for 1974-75 is available and fairly consistent. Prior to 1974-75, the cost data is fragmented and definitions are inconsistent. Enrollment data prior to 1971 is also inconsistent. More recent data has not yet been compiled.

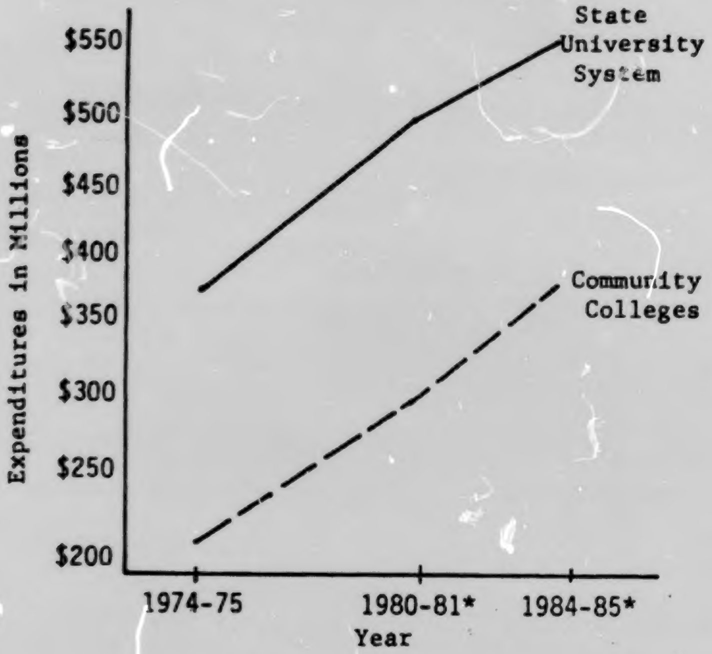

Fig. 1. Projected higher education expenditures; amounts are total expenditures, i.e., GRF funding, tuition, plus funds from all other sources. (*future estimations)

Community Colleges

The total annual unduplicated enrollment (headcount) for the 1974-75 school year in all the community colleges (CC) was 532,089. This represents an annual full-time equivalent (FTE) of 157,575 or an average FTE enrollment of 52,525 per quarter statewide.

In 1974-75, Miami-Dade CC had the highest annual enrollment at 33,230 FTE's and South Florida CC in Avon Park had the lowest at 745 FTE (2).

There are five categories of instruction at the community college level. They are:

- Advanced and Professional Instruction. This provides the courses and curricula designed to provide the first two years of course work leading to an advanced or professional degree. It includes both general education and specialized lower division courses.
- Occupational Instruction. Includes both credit and non-credit courses and curricula designed to prepare persons for an occupation without subsequent training in another institution of higher education. Some of the courses may be transferable to state universities.

- Developmental Instruction. Courses and curricula to prepare persons with college entry level knowledge, skills, and attitudes.

- Community Instructional Services. It includes organized instructional activities designed for specific clientele groups in the community and is not a part of the degree or certificate requirement in any of the other instructional programs.

- Other Personal Objectives. For students not taking courses to complete a curricular program but to satisfy personal objectives, e.g., renewal of a teaching certificate.

The total annual enrollment in each instructional category is as follows (2):

• Total Advanced and Professional	91,757.7 FTE
• Total Occupational	48,474.8 FTE
• Total Developmental	12,069.1 FTE
• Total Community Instructional Services	5,274.0 FTE
	157,575.6 FTE

The actual enrollment (headcount) in each semester including part-time students was approximately 283,000.

Thus, the Florida CCs are reaching the desired goal of availability to 99% of the state's population.

Expenditures and Revenues in CCs. Most (75%) of the revenues for the CCs comes from legislated funding. Student fees contribute 23% with other sources making the remainder. Total revenues for the General Current Fund are $188,575,001 (2). There is a restricted current fund of $16,208,744 which is composed of State Grants and Contracts (11.6%), Federal Government Funds (84%) and other (4.4%) (2). The total Education and General expenditures are $203,739,080 including the restricted funds. Of the total Education and General expenditures, salaries are 77.9% (this includes both instructional and noninstructional personnel), current expenses are 17.6% and capital outlays are 4.5% (2).

Table 1 shows the composition of Education and General Expenditures by category percentage for 1974-75.

It is interesting to note that instructional costs are less than 50% of total E & G expenditures and of that only 55.8% is salary expense for 3900 full-time and an undetermined number of part-time faculty (2).

Florida's CC system enrollments are expected to grow 38% by 1980 and then by 25% until 1985 or a total change of 73% (1). Expenditures for CC from the GRF are expected to increase 95% for the same period.

Table 1

PERCENTAGE OF EDUCATION AND GENERAL EXPENDITURES BY CATEGORY FOR COMMUNITY COLLEGES FOR 1974-75

Category	Percent of Total E & G
Instruction	47.7%
Institutional Support	19.8
Academic Support	11.1
Plant Operation & Maintenance	11.1
Student Services	8.7
Student Aid	1.4
Other	0.2

Of the increase 48% will be for an increased adult population, 38% for expanded programs due to demand from a larger proportion of the adult population, and 14% from an increase in expenditures per student.

The average full cost per FTE for the entire system is $1257.18 (2). The range is from $1,083.75 for Okaloosa-Walton CC to $1,768.62 for St. Johns River CC (2).

State University System (SUS)

The nine universities of the SUS had a four-quarter average statewide enrollment (headcount) of 107,731 for 1974-75 (1).

Enrollments are divided into four categories:

- Lower Level Undergraduates (freshman, sophomore)
- Upper Level Undergraduates (junior, senior)
- Graduate
  - i. beginning graduate (all masters students)
  - ii. advanced graduate (doctoral level)
- Professional Units (health, medical, and agricultural units)

The total four-quarter average FTE including professional units was 77,515 for 1974-75. The fall quarter had 88,374 FTE and the summer quarter only 38,558. The University of Florida was the largest institution with a four-quarter average of 19,124 and the University of North Florida, in its third year, was smallest with only 2,453 FTE (3).

The 1974-75 breakdown of FTE by student level is as follows:

Lower level undergraduate	18,271 FTE	
Upper level undergraduate	41,431 FTE	
Graduate	15,377 FTE	
Professional units	2,436 FTE	
	77,515 FTE	(1)

There is a projected increase in enrollments of 41% by 1985 to 109,241 FTE (1). The bulk (30%) of the increase will occur by 1980.

The total amount allocated for the SUS from the General Revenue Fund was $254 million in 1974-75 (4). The total expended from all sources was $429,190,068. How these funds were allocated is shown in Table 2.

Instructional costs of $203.2 million are expected to increase 57% by 1985 to $318.9 million (1). There were about 20,051 faculty positions in the SUS in 1974-75 and instructional direct cost totaled $95 million (5).

Instructional direct cost includes:

- the portion of faculty salaries directly associated with instruction
- a proportional share of non-faculty salaries in teaching departments
- supplies and services that are directly associated with instruction

Excluded from direct costs are:

- research and public service expenditures
- academic support expenditures for libraries, registrars, computer support, executive management, physical plant, etc.
- non-faculty salaries and wages associated with non-instructional activities.

Approximately 52% of the full cost of General Academic Instruction is attributed to direct costs and the remaining 48% to allocated support

Table 2

EXPENDITURES AND SOURCES OF REVENUE FOR THE FLORIDA SUS IN 1974-75

Activity	Amount
Educational & General Activities	$232,172,927
General Office	11,609,700
University of Florida - Institute of Food and Agricultural Sciences	31,401,358
U of F - Engineering Industrial Experiment Station	6,704,856
U of F - Veterinary Medicine	455,345
University of South Florida Medical Center	6,702,066
Contracts and Grants	42,285,917
Auxiliary Enterprises	53,650,612
U of F - J. Hillis Miller Health Center Educational and General	17,264,067
U of F Health Center - Shands Teaching Hospital and Allied Clinics	26,943,220
Total Expenditures	$429,190,068
Revenues by Fund:	
General Revenue Fund	254,016,941
Trust Fund	175,173,127
Total All Funds	429,190,068

expenditures. These generally have a direct relationship to the instructional process. They include expenditures for:

- advising and registering students
- library operations
- classroom facilities

Total expenditures for the SUS are expected to increase to $362.7 million or 42% by 1985 (1). Approximately 64% will be for population growth, 26% for expanded programs, and 8% for increased real expenditures per student.

Student fees currently cover 26% of the SUS's instructional cost but are expected to rise to 31% by 1985. By level, the instructional costs covered by students fees are:

Lower Level Undergraduate	40%
Upper Level Undergraduate	25%
Graduate	20%
Professional Units	30%

Summary and Analysis

Higher education in Florida enrolled 230,748 FTE students for 1974-75. Approximately $395 million of General Revenue Funds were spent in the Community Colleges and State University System. Enrollments are expected to increase 73% by 1985 in CC and 41% in the SUS. Total expenditures from the GRF for higher education are expected to increase a total of $197.8 million or 49.6%.

As can be seen in the following table, there is significant difference in the number of FTEs and total expenditures by the two divisions of higher education.

Table 3

COMPARISON OF COMMUNITY COLLEGES AND SUS FTE, GRF FUNDING AND TOTAL EXPENDITURES IN 1974-75

System	FTE	GRF Funding	Total Expenditures
Community Colleges	157,575	$141 million	$203.7 million
SUS Institutions	77,515	$254 million	$429.2 million

Community colleges instruct undergraduates for an apparently lower amount per FTE when compared with the average university cost. These figures can be misleading, however, because the two systems are not duplicates of each other. For example, the community colleges have larger class sizes, more part-time teaching positions, heavier teaching loads per instructor, and a lower overall level of faculty training with a corresponding lower average salary than in the SUS (2). Universities, on the other hand, provide instruction at higher levels and produce research, both of which are inherently more expensive. Class sizes are generally smaller when students become more specialized in their particular field. Also, a higher level of faculty educational attainment is required to teach the higher levels in the SUS. Research itself is labor intensive and requires a high level of competence. When the same levels of instruction are compared, the community college system-wide average full cost per FTE is $1,257 (2) and the average full cost per FTE for lower level students in the SUS is $1120. On the other hand, the upper level average in the SUS is $1827 per FTE. Thus, when the same levels of instruction are compared between community colleges and the SUS, we find average costs per student to be essentially the same with SUS average FTE costs being slightly lower.

Performing the cost analysis in this chapter has not been an easy task because there is a dearth of detailed cost data for higher education in Florida prior to 1974-75. This is due to the lack of reporting requirements or requiring an agency to be responsible for collecting and evaluating such data in the past. Hopefully, this will no longer be a problem because the Board of Regents is now collecting these data from universities and the Department of Education maintains such data on the community colleges. It is difficult to measure growth and to analyze expenditures in specific areas over the years without an adequate data base. A better analysis will be made in the future with the improved data now being gathered.

What can we say about areas for cost reduction? Inasmuch as about 52% of Education and General expenditures for the SUS are for instructional costs, any major cutbacks would have to occur here. With growth in the institutions of higher education through increased population and program expansion, alternatives to adding faculty will have to be found if spending is to be held at a constant level.

The benefits to society from higher education are well known. To cut back on instructional costs merely to save dollars, without consideration of the total effects, would be shortsighted. To be sure, higher education is subsidized and the cost to the individual is underpriced. But the benefits received accrue to society as a whole. Therefore, as long as there are positive returns to the individual and to society, there will be increased demand for higher education and a corresponding higher level of expenditures required.

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2. Florida Department of Education. Report for Public Community Colleges - 1974-75. (1976)

   (For a complete breakdown of enrollments and expenditures by college see the above document.)

3. Unpublished data from the Florida Department of Education. (Does not include Professional Units.)

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Chapter 2

DISASTER IN FLORIDA'S HIGHER EDUCATION SYSTEM, 1985:

A SCENARIO

by

Cynthia K. Hoffman

> *Forecast For The Future: 1975*
>
> *"In short, the financial prospects of universities in the foreseeable future are dim. Costs will continue to rise, while income is likely to fall short of keeping pace. Pressure for wage and salary increases for both academic and nonacademic employees will exceed the institution's capacity to respond, thereby resulting in some cutbacks in personnel (probably through attrition) so that the available resources can be spread over fewer people. This will further aggravate the market for new Ph.D.'s, but is probably unavoidable. Tuition will inevitably rise as the cost of living continues to go up, but resistance will grow and, with enrollments falling, institutions will be less willing to let tuition rise. Endowment income is at best uncertain in a world which seems to be in the throes of a major international financial realignment, and in which the American position is less strong than it once was."*
>
> *(1, p. 15)**

The Present Fiscal Situation: 1985

The year is 1985 in the State of Florida. The state's educational system has been fighting a battle to reduce expenditures for seven years, but it has not been successful. This year's projected expenditures for education alone constitute 86% of the state General Revenue Fund (GRF), leaving only 14% for all other state services combined. Educational expenditures comprised only 58.51% of the GRF in 1975 (2).

A significant portion of this increase in education expenditures is attributable to the expansion of Florida's higher education system. Expenditures for community colleges have doubled since 1975. Approximately 48% of this increase is due to the cost of serving a larger adult population. Thirty-eight percent of the increase is related to the costs of program expansion, and 14% is due to actual increases in per pupil expenditures (2, p. 8).

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

Expenditures for four-year institutions in the State University System (SUS) have increased by 50% since 1975. Approximately half of this increase is due to population growth from 1975 to 1981. Twenty-seven per cent of the increase is a result of higher program costs due to such factors as inflation and salary increases, and 23% is related to the cost of program expansion.

State revenues have not increased enough to meet these demands. Florida still ranks 48th among the 50 states--as it did in 1976-77--in terms of the state legislature's annual increases in appropriations to higher education (3). This can be seen in the table on the following page.

In addition to the continued low level of commitment for Florida in relation to the other states, the table also shows a very different trend in annual appropriation changes for 1984-85 than for 1976-77. In 1976-77 all states except Maine received some form of increase, the U.S. average being a 24% increase. However, this year many states are receiving appropriation cutbacks--the highest being 28%. And the U.S. average for state legislature appropriations this year is only a 5% increase.

Florida's legislature appropriated a 5% funding increase to higher education in 1976-77. But this year (1985), the legislature mandated a 20% cutback! With the rising costs of higher education over the last ten years, it is evident that a fiscal crisis now exists.

However, this is by no means the first time that the Florida Legislature has indicated dissatisfaction with present spending trends in Florida's higher education system. It mandated a gradual 20% decrease in 1981, to be realized throughout the higher education system by 1985. Only 3% of that mandated decrease has been realized to date, and that has been offset by unexpected litigation costs in the system.

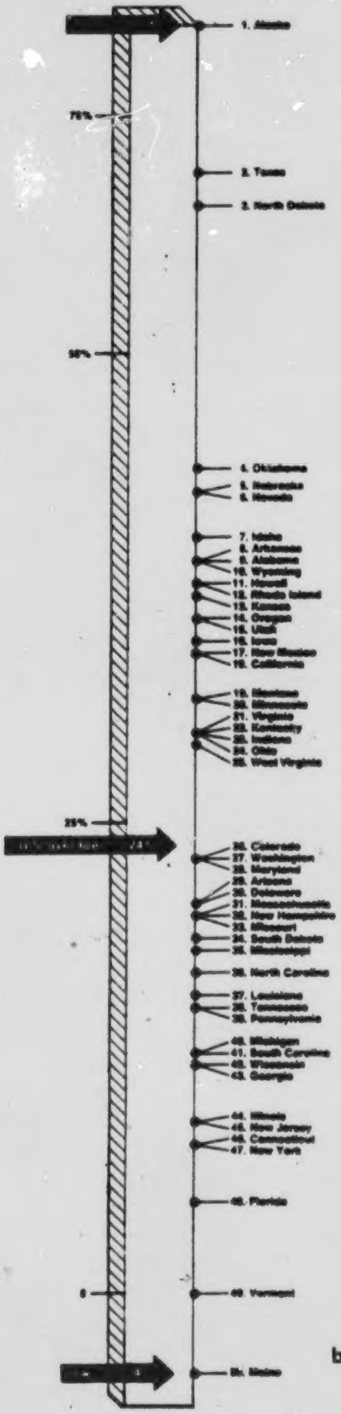
As mentioned earlier, the total costs of public education for this year are expected to comprise 86% of the GRF. But the funds are just not available to support that kind of commitment to education at the expense of the other state services. There are two public education subsystems vying for access to the funds: higher education and K-12 public education. Due to public pressure and general values, K-12 public education is receiving priority over higher education, So, although both systems are required to cut back, higher education is being dealt far more stringent cutbacks with less support from other state services.

Many believe that the answer is to find a way of operating the existing higher education system for 20% less--immediately! Unfortunately, it is impossible at this time to reduce the costs of the system by 20% without any major changes in the way it operates. But even if it were possible, many of the savings would be cancelled out due to indirect costs of situations resulting from the growing dissatisfaction with the effectiveness of the system.

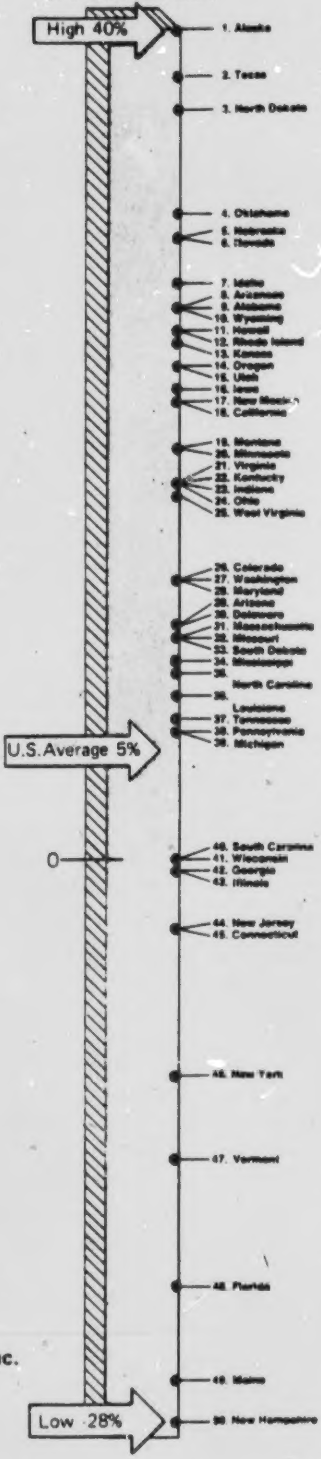
Given the situation as described above, it is at least possible to believe (though not easy to accept) that the following disaster is now a reality for Florida's higher education system, even though we thought it could neven happen to us.

How the 50 States Compare in Higher-Education Financing

Percent increase in appropriations from 1974-75 to 1976-77 *



Percent increase in appropriations from 1982-83 to 1984-85 *(PROJECTED)*



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DISASTER 1985: THE CUNY TRAGEDY REVISITED

The CUNY Situation, 1975

In the spring of 1975, while most colleges and universities were quietly going through commencement, the City University of New York (CUNY) ran out of money and closed down all its branch colleges. Students were left without promise of certification for courses and programs they were about to finish. Unpaid faculty and staff rushed to join the unemployment lines. A $90 million academic complex under construction at City College was abandoned, half-finished, with surface rust spreading over its exposed steel beams. The major outcomes of that crisis were that the CUNY

- Ended its 126-year-old policy of free tuition for city residents and imposed charges that were among the highest for public colleges and universities in the country at that time.
- Limited its admissions, ending the total open admissions policy introduced in 1970 to aid the social and economic rise of masses of New York's black and Puerto Rican migrants.
- Absorbed a 17% cutback over a 2-year period, forcing it to cut out of its payroll 4500 full-time employees, including 2900 faculty members and administrators.
- Accepted a restructured governing board that substantially increased the power of the state government, thus reducing the power of the city in its own affairs (4).

The Present Florida Situation

Florida's present situation parallels the CUNY tragedy very closely with a few minor differences. The SUS and community college systems are much larger than CUNY was in 1975, and a number of the member institutions have escaped the shut down. However, 6 universities and 10 community colleges have been forced to close down within the last 6 months. Many of the closings occurred during the middle of the term, so grades and credits have been held up indefinitely. A number of them closed right before graduation; therefore, approximately 20,000 students are waiting to be awarded degrees for which they have fulfilled all requirements. This situation has resulted in massive student protests and rioting on the affected campuses as well as hundreds of class action law suits against the SUS for breech of contract.

The state is also facing heavy litigation from the faculty unions due to the fact that approximately 2500 faculty have been laid off in the affected institutions.

The unions are claiming that the lay-offs are a result of poor institutional planning and resource allocation rather than financial exigency. They point out that some of the state's institutions have been able to avert disaster even though they have proportionately equal state funding.

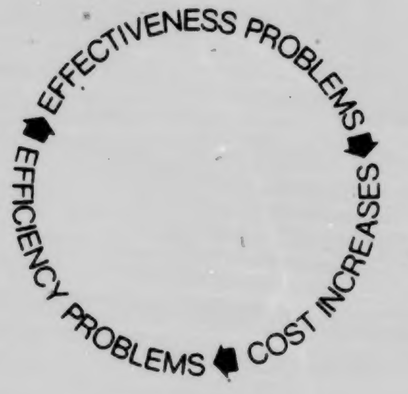
The massive faculty and administration lay-offs have also caused a drain on the state's unemployment compensation fund. In addition, the disaster has further affected the state's economic system by forcing the migration of many faculty and administrators who are qualified enough to secure positions at universities in other states.

Unfortunately, recent state audits have revealed that two more universities and four more community colleges may be joining the other institutions which have closed down. Their approach to averting disaster has not worked as planned. These institutions imposed a 75% increase in tuition rates at the beginning of the 1984-85 academic year in an attempt to generate more funds to support operating budgets. But these tuition increases were met with a 45% increase in the annual drop-out rate. Thus, the increased dollar intake due to the tuition hike was nearly negated by the loss of total tuition fees from the students who dropped out.

Commitment to the K-12 system has traditionally taken priority over the commitment to the higher education system in Florida. Given the financial crises in the K-12 system (5), which is competing for attention with the disaster occurring in higher education, the immediate future for Florida's higher education system appears to be grim.

WHAT CONDITIONS HAVE PRECIPITATED FLORIDA'S DISASTER?

INTERACTIONS OF EFFECTIVENESS AND EFFICIENCY PROBLEMS



The Accountability Crisis

It has been suspected for a long time that high grades in college do not necessarily ensure achievement after graduation. This was validated by D. P. Hoyt in his 1965 review of forty-six studies on the question (6). But it was not until the late 1970's that students began to believe that they had a right to expect that if they did well in college it should mean that they had attained the skills and knowledge required for high-level achievement in an occupational area outside the college setting. And, to carry that line of reasoning further, they came to expect that if they were granted a college degree, it should mean that they actually possessed--and could demonstrate--the skills and knowledge implied by that degree.

The notion that this was a legal right has not been tested, however, until this year. There are 230 cases on the Florida dockets which involve suits against the State University System for not delivering skills promised in accordance with the degree conferred (7).

Forty-six of the pending cases are class action suits. For each of these suits, if the case were won, damages would have to be paid to all graduates of the SUS who could prove similar deprivation of promised skills. The potential dollar costs of these class action suits to the Florida higher education system are astounding. The costs of defense alone for these cases are predicted to reach at least $500,000 by the end of this year. If plaintiffs are awarded damages in the class action suits, these must be multiplied by the number of people identified as members of the deprived class in order to determine the full costs of the suit. Clearly, if a number of these class action suits are won by the plaintiffs, the dollar costs alone to the higher education system will be astronomical--well into the millions.

The Utility Crisis--A Market Overload For Higher Education Degree

> *(Predicted: 1975)*
>
> *". . .the differential advantage in the labor market enjoyed by college-educated people--some of it due to education per se and some to the sorting and screening function of higher education--will narrow and eventually disappear (8, p. 13)."*

A large portion of our society has long held the belief that one who possesses a graduate or undergraduate degree is assured of gaining employment in his or her desired profession and at least a moderate degree of financial security. A recent statewide poll has shown that this is largely a myth for those who have graduated from Florida SUS institutions within the years from 1976-1982. It appears that a higher education degree is not nearly as useful as it once was for assuring entry in one's desired field.

Twelve thousand college graduates were polled over a period of 3 years; approximately half of them had received either associate of arts or bachelors degrees. Those who had received masters degrees comprised about 35% of the population polled, and the remaining 15% were Ph.D. graduates. The results of the poll were as follows:

- Sixty percent of those with bachelors degrees in the liberal arts had not found employment in their field. At least half of these people were currently employed in jobs which do not even require a bachelors degree (8).

- Only 25% of those with bachelors degrees in elementary or secondary education were currently employed as teachers.

This was due mainly to the severe cutbacks in hiring new teachers since 1980 in an attempt to save money by increasing the student/teacher ratios via teacher attrition.

The same approach to saving money in higher education has contributed greatly to the severe reduction in the market for new Ph.D.'s (1), because college and university teaching and research positions have traditionally been the main source of employment for Ph.D. graduates.

- Only 25% of those graduates polled who received Ph.D.'s have found employment requiring a Ph.D. in their field.
- Eighty-six percent of those graduates with masters degrees have found employment requiring either an M.S. or an M.A. But only 35% are working in their area of specialty.
- Only 40% of those receiving A.A. degrees in the community colleges have continued their undergraduate study in 4-year institutions.* Fourteen percent are unemployed. Eight percent are either married and not seeking employment or they are in the military service. Thirty-eight percent are employed, but only half of those are employed in jobs which require more than a high school degree.

These figures for the community college graduates have changed since 1975 for the following reasons:

(a) Fewer graduates of the A.A. program are going on for the Bachelors degree because of the effectiveness problems described in the previous section, as well as the lack of utility of the Bachelors degree as described in this section. These deterrents are combined with two other constraints--the drastic tuition increase at the 4-year institutions as compared with the community colleges, and the increased expenses of having to move away from home.

(b) There are not enough jobs to support the increase in seekers holding only an A.A., so the unemployment rate has increased.

(c) More people are joining the military services due to increased pay and benefits.

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*These projections are based on actual 1975-76 statistics: 12,836 of 18,899 A.A. graduates were studied; 71% placed in 4-year higher education institutions; 24% employed (degree requirements of jobs unknown); 2% unemployed; 4% not available for placement--military, housewife, etc. (11).

The Enrollment Crisis

In 1975, the Florida Department of Education projected 10-year enrollment increases in the higher education system. The projected increases ranged from approximately 25% in the lower level SUS programs to 104% in the community college developmental programs (2).

These projections were being realized from 1975 to 1980. But the trend started to reverse, and enrollments began declining drastically in 1981 (12, p. 41). There were many reasons for this decline. The major ones were: (i) a decline in the absolute number of college age youth; (ii) the low success rate for obtaining employment commensurate with the level of degree held by graduates of the higher education system; and (iii) the litigation against higher education institutions for not delivering the skills implied by conferred degrees. The effectiveness problems were accountability problems related to the system's failure to provide the skills and knowledge implied by institutions' degree programs. Even if this type of internal effectiveness (13) would have been achieved, it would not have been enough to maintain a trouble-free system. The system must also have external effectiveness (13), or utility. This means that those skills attained in the higher education system would be useful to the graduate in obtaining employment in the profession or academic field for which (s)he received a higher education degree.

Another factor in the enrollment decline was the increasing cost of higher education to the student due to constantly rising tuition fees. Many students and their families began to question the value of spending that much time and money for a bachelors degree if it would not ensure job security. (The statewide poll described in the last section validated this suspicion.) They often chose, instead, to seek technical certification in an area vocational school or in a specialized 2-year community college program.

One other factor which may have contributed significantly to the enrollment decline was the change in campus life style (14). By 1980, the doctrine of in loco parentis was no longer operating at any of the higher education institutions in Florida. Institutions no longer placed restrictions on students' personal lives, such as curfews and specified hours for dormitory, sorority or fraternity room visitation. By 1980, the only type of housing provided by the university was in the form of student apartments. This is still the case today, and in addition to the other reductions in "student care", students must provide their own meals due to the fact that all dining hall facilities have been discontinued as a result of a 1979 movement across the SUS to save money.

These changes were facilitated by the significant increase in the number of student commuters--or "day students"--particularly in the more heavily-populated areas of the state. And the severe reduction in fraternity and sorority membership since 1975 is attributed by many to these changes in collegiate life style.

Some students and parents found the elimination of the in loco parentis approach desirable. But it served to alienate those parents--and students--who viewed higher education as an extension of a protective home environment which provided organized peer group experiences for social development through dormitory living or membership in a sorority or fraternity.

The results of this unpredicted reversal in enrollment growth have been manifested in terms of decreased institutional efficiency. Major expansions in programs, staff, faculty, and facilities were implemented throughout the states's higher education system in the 1960's. When the financial "crunch" came in the mid to late 1970's, the planners decided not to make major cutbacks in programs and faculty due to the projected enrollment increase in the 1980's. Many of the faculty who were hired during the expansion stage of the 1960's gained tenure, and the programs to which they were appointed stayed on. But the programs are now underutilized with extremely low student/teacher ratios, which are costly and inefficient.

This situation is compounded by the reduction in revenues from tuition fees brought on by the decrease in enrollments. And it is also accompanied by severe reduction in alumni contributions due to the extreme discontent with the educational performance of their alma mater.

The Research Crisis

Outside funding to support research projects had been a major source of income for the SUS until 1980. During that legislative session a bill was passed which required all SUS faculty, without exception, to teach at least 12 credit hours per quarter. With the implementation of that legislation, most faculty members who had been prolific researchers in the past found that they had to decrease their research activity. There just were not enough hours in the day to maintain the same level of research activity with--what proved to be in many cases--a 200% increase in their teaching load. That is, they were now required to teach three courses instead of one.

This caused two types of costs:

- A decrease in funds for the SUS normally obtained via outside research grants.
- A decrease in academic excellence and national reputation.

An institution is often judged in terms of placement of its graduates, and by the quality of its past and present research efforts. As a result of the reduction in research productivity, the SUS can no longer attract the high caliber graduate students it once did because of an inability to provide financial support and because of decreased funding and decreased reputation. This has had a cyclical effect, because the implementation of research projects now requires a greater dependence on both quality and quantity of graduate student participation due to the reduction in faculty research time. With fewer research assistants available, less research is done; and as less research is done, fewer research funds are obtained.

COMPOUNDING FACTORS BASED ON TRADITIONS IN HIGHER EDUCATION

Competition vs. Cooperation

Competition between Florida's state higher education institutions for national recognition has traditionally been accepted as a healthy approach--one which stimulates productivity and standards of excellence. However, competition between universities has often resulted in duplication of academic programs within the SUS. And now that limited funds are being equally distributed among a number of nearly identical competing programs, none of the programs is receiving the level of financial support required to achieve national recognition (15). In fact, the effect of spreading so few funds across so many competing programs has been that most of the programs are barely able to meet former state standards, let alone national standards of excellence. Examples of such program redundancy between institutions are as follows:

- There are nine colleges of education in the SUS. In spite of the fact that during the last four years there have been teaching vacancies in the State of Florida for only 30% of the program graduates.
- There are two oceanography programs, and each one is filled to only 65% of its student capacity.
- There are law schools at both Gainesville and Tallahassee. It is projected that there will be a 50% statewide surplus of law graduates by 1990 and a 30% surplus nationwide by the same year.
- Five of the nine (16) state universities have lower as well as upper divisions even though state community colleges with 2-year "university parallel tracks" are located in the same towns. All are underenrolled.
- The University of Florida and Florida State University have high-paid faculty members (above $45,000/year) serving as experts in twenty-seven areas. No effort has been made to eliminate such expensive duplication by having one expert develop mediated instruction for use at the other institutions. Some of these high-priced faculty lines could then be distributed so that a wider range of area expertise could be addressed within the SUS (14). The overall effect of program duplication is reduced efficiency especially when programs are under subscribed as they are in the examples given above.

Course proliferation, another form of redundancy, has also occurred within institutions. For example, colleges within a university often offer their own statistics courses. Research methods courses are often offered in a number of different departments within the same college. Systems analysis programs are sometimes offered as major areas of concentration in a number of different colleges within the same university, such as the school of engineering and the school of education. There have been very few attempts to systematically reduce proliferation by:

- Combining related departments into interdisciplinary programs
- Redesigning the main courses in statistics, research methods, systems analysis, etc., to be more generalizable to a variety of related disciplines
- Utilizing those main research, statistics, and systems courses--instead of each department's own specialized one--when advising students on course schedules.

Course proliferation has been a long standing problem and has been sustained by the general belief that each discipline is, by its very nature, so different from all other disciplines that it should maintain an autonomous position within the university. Each academic department believes that it requires its own specialized version of statistics, research methods, law, etc. to reflect its discipline's unique interests.

Although this attitude is still visible today, it is not nearly as prevalent as it was twenty years ago. There is now a new rationale--based on economic consideration--for maintaining specialized versions of these types of courses in each department. Requiring students to take more courses within the department serves to maintain, if not increase, departmental budgets. Allocations might be reduced if majors were allowed to take courses outside of the department.

Open Admissions/Instate Tuition

Since the early 1970's, Florida had maintained minimal requirements for admission into the higher education programs due to a commitment to make such education widely available to Florida residents. And in order to alleviate the cost constraint--in addition to the qualification constraint--it has always provided lower tuition rates for Florida residents.

In 1980, however, in response to pressure from state and federal equal educational opportunity legislation, Florida adopted an open admissions policy which eliminated even its minimal admission requirements. Yet it maintained its lower tuition rate for state residents, and at present this tuition covers only 30% of the cost of educating a student in a Florida institution of higher education. The result was an increase in the number of students being supported by the state for 70% of their educational costs.

With the elimination of standards of admission came an increase in the number of poorly-prepared students entering the system, which led to an increase in the attrition rate after the first year. It became evident after litigation, threats, and actual withdrawal of institutional funds that the adoption of an open admissions policy was not enough to satisfy the re-requirements of equal educational opportunity. Something had to be done to provide extra help for those students entering without the prerequisite skills. Remediation programs were tried with some success, but the attrition rate remained above the level of acceptability to HEW.

Finally, in 1983, mastery-type learning systems (17) were implemented in many of the high attrition programs. The overall attrition rate reached acceptable levels by the end of 1984. However, the cost of the mastery learning system was one of the largest single factors contributing to the present financial "crunch". There were major front-end costs for reorganization, training, and materials development. And students in the mastery learning programs spent more, rather than less, time in the institution even though they paid the same amount of tuition as everyone else. Although fewer faculty members are required in a mastery learning system, no faculty have been laid off to defray the costs of the system.

Collective Bargaining

The major faculty unions in Florida began gaining strength in the early 1970's, and by 1976, the SUS faculty had adopted one of the major unions to represent them at the bargaining table. The union influence is among the major factors related to this year's financial crisis. These influences have been experienced in the following ways:

- The unions have achieved consistent faculty pay increases for the last four years without regard for lack of resources due to funding cutbacks. The result has been the elimination of staff and facility support for faculty, many of whom would prefer the support instead of a relatively small pay raise.
- The unions have provided a means to enforce the Omnibus Education Act* by creating a visible, consistently-applied grievance procedure. The result has been a decrease in the number of non-promotion decisions. This has led to a lower faculty attrition rate, thereby decreasing an institution's flexibility to hire lower priced personnel such as graduate teaching assistants, research assistants and assistant professors.
- The unions have adamantly resisted the use of instructional technology--which could improve institutional cost-effectiveness --because it threatens to deprive faculty members of jobs.

State Aid To Private Institutions

For years there has been a national on-going debate over whether or not private or church-related institutions should receive state funds. Two 1976 Supreme Court decisions supporting state funding for church-related colleges (18) gave impetus to a trend in Florida which has led to the present level of support for private colleges--that is, 18% of Education's share of the GRF.

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*The Omnibus Education Act of 1973 requires that faculty be evaluated on the basis of assigned duties and that failure to publish is not sufficient grounds to deny tenure or promotion.

In the late 1970's the following rationale was employed to use those decisions as justification for increasing support of private and church-related colleges:

> *It is less expensive to keep those institutions open with state aid than to incorporate students served by those institutions into the state higher education system.*

This seemed reasonable at the time, and it did serve the intended purpose for a few years. However, with the reversal in enrollment trend, the SUS and community colleges began to perform inefficiently due to underutilization of faculty and facilities. Now it would be beneficial financially to incorporate students at private colleges into state institutions. This would also eliminate the state aid expenditure. But the commitment to the private institutions has become too firmly entrenched for withdrawal of state support at this point in time.

Conclusion

Financial disaster can not be averted by simply increasing the efficiency of institutions without concern for their effectiveness. Lack of effectiveness has been demonstrated in at least two ways. One has been in the number of law suits which allege that promised knowledge and skills have not been delivered to graduates. The second and closely related reason can be inferred from the reduction in enrollments. Many potential students no longer believe that a college degree will guarantee them access to the better paying jobs in society. High unemployment rates among college graduates thus reflect the higher education system's lack of utility or external effectiveness (13).

> *...even the most efficient business can not survive, let alone succeed, if it is efficient in doing the wrong things, that is, if it lacks effectiveness.*
>
> *No amount of efficiency would have enabled the manufacturer of buggy whips to survive. Effectiveness is the foundation of success-efficiency is a minimum condition for survival after success has been achieved. Efficiency is concerned with doing things right. Effectiveness is doing the right things (19, p. 45).*

Effectiveness is a meaningless term if educational goals and objectives have not been defined, because effectiveness can only be judged by the extent to which an institution's goals have been attained. However, this assumes that the goals were worth achieving to begin with. The lack of definition of goals and objectives in operational terms seems to be the basis for the disaster that has occurred here. Broad, non-specific goals do not provide a means for setting spending priorities because they do not provide guidelines for deciding between alternatives. It is simply too expensive to implement every new course of program that comes along while continuing to support the old ones. And the problem is compounded when ineffectiveness causes additional expenses to the system such as litigation costs. A set of such broad goals can also be conflicting in that some of the alternatives considered acceptable in meeting one goal may be among the range of alternatives considered unacceptable for meeting another goal. For example, a goal of open admissions for all, regardless of academic ability, may conflict with a goal of academic excellence. In addition to being specific and non-conflicting, institutional goals should reflect the external needs* of the society for which they have been created to serve. The utility crisis described in this scenario, and its effects on enrollment trends, is just one example of the external effectiveness problems which can occur when institutional goals are not defined in terms of external needs (13).

> *"If institutions lack priorities and react to every request for service, then apparently they have no mission other than the unwritten purpose to survive. This, however, is not a viable mission." (8, p. 18)*

In order to establish the mission of higher education in terms of well-defined, non-conflicting goals with an external referent (13), the following questions must be asked:

- What are the external economic, social, and political purposes of the higher education system?
- Why has it persisted through generations?
- Why should it exist in the future? (8)

These questions must be answered before criteria for effectiveness can be determined. Two of the crises which have led to the present disaster resulted from the failure to answer the first question adequately. These are the crises concerning over-production of higher education degrees and litigation for failure to deliver promised skills. The third crisis described in the scenario resulted from a failure to answer all three questions above early enough to predict the reversal in the enrollment trend.

Since the early 1970's methods have been available for defining and achieving goals which meet the criteria described above. But these methods have not been used to their fullest advantage in Florida's higher education system. Those which show the greatest promise for preventing future disaster of the type encountered this year are research-based long range planning, total resource (vs. annual increment) budgeting, cooperative resource planning, and planned staff reduction/reallocation. Brief descriptions of each type are found in the next two pages.

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*For further information on this concept, see Chapter 6.

SUGGESTED CHANGES IN MANAGEMENT OF HIGHER EDUCATION--1975 (NONE YET FULLY IMPLEMENTED--1985)

LONG-RANGE PLANNING

"Few colleges and universities have adequate facilities for the advanced planning of their needs and resources. The key to such planning is the development of institutional research which provides data and knowledge of a specificity and range not now available. Only then can a planning committee and staff function (20, p. 345)."

BUDGETING

"College and university budgeting should be directed to the reallocation of the total resources of the institution rather than to annual increments. Changes in colleges and universities will have to depend on a kind of budgetary review not now taking place. In a period of financial stringency, substantial substitution of programs rather than addition to them must be the principle that guides those responsible for decision-making. It can no longer be assumed that new programs will be supported by extensive new funds. Unpopular decisions will have to be made and explained (20, p. 345)."

COOPERATIVE RESOURCE PLANNING

"Resource-sharing for expensive or unique facilities will become a financial necessity for all colleges and universities. More important, however, are the educational improvements that would be realized through imaginative cooperative efforts of a kind that are now taking place. Colleges and universities ought to share scarce human talents through joint appointments, permitting either students or gifted teachers to move among campuses. The use of modern technology by several institutions involved in collaborative enterprise is also called for. Most difficult, however, is cooperation based on the willingness of one institution to abandon an established field of study entirely, recognizing that opportunities for such study exist elsewhere in the region and can be made readily available to its students (20, p. 346)."

STAFF REDUCTION AND REALLOCATION

"One can cut back a tree to keep it from obstructing wires or getting in the way but, in the process, harm the health of the tree. Pruning is a distinctly different procedure than just cutting back. It takes skill to know where buds will emerge, where cutting will allow the most light, and where limbs will remain relatively ungnarled. In the past, staff reduction and reallocation have been done more like cutting back the tree--trimming to get smaller, with only minor insight toward the long-range health of the institution. . . . Organizational development is more like pruning. . . . If it is to be successful, one must recognize the long-term health of the organization as well as the short-term, and not be blinded by the current demands for a balanced budget (20, p. 346)."

In this scenario, numerous factors have been identified in terms of their contribution to the present disaster. Other factors are discussed in the following scenarios in response to these questions:

- Could this disaster have been averted by implementation of large-scale technological applications such as instructional television, computer-assisted instruction or computer-managed instruction? (see Chapter 3)
- What might have been the potential for avoiding this disaster through the use of small-scale technological applications such as audio and video cassettes combined with systems technology such as competency-based education and personalized systems of instruction? (see Chapter 4)
- Are the compounded problems described in this scenario just chance happenings, or can they be predicted and planned for? (see Chapter 6)
- What are the basic assumptions upon which Florida's higher education system are based? Does a change in some of these assumptions offer potential for avoiding a disaster such as the one described in this scenario? (see Chapter 7)

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Chapter 3

SCENARIO OF A SUPPLEMENT TO THE REPORT OF THE COMMISSIONER OF EDUCATION 1985-86

by

Craig Hewitt

Introduction

This section of the Commissioner's Report is the second part of a look at how technological applications, based on "big media," helped Florida to deal with rising costs and enrollments in education. Higher education in Florida consists of nine state universities and twenty-eight community colleges. The control and funding of the two systems are somewhat different. Approximately 70% of community college funding comes from General Revenue Funds (GRF) (1).* For the State University System (SUS) 59% of total expenditures is derived from the GRF (2).

In the mid-seventies the State of Florida realized it was facing a financial crisis. Costs were rising, enrollments were rising, and projected revenues in constant dollars were expected to remain the same or fall slightly (1). Therefore, there were three options open to deal with the problem. The first was to do nothing. The higher education system could be kept at the same level of funding and allowed to deteriorate (see chapter 2). Second, funding could be increased substantially and the traditional system allowed to continue with no modification and possibly lowered effectiveness. The last option was to find alternative methods of providing instruction. Florida decided to continue to be one of the leading states in educational innovation. "Big media" were the means chosen to stabilize rising expenditures. Computer-based instruction was expanded and a more intensive use made of instructional television.

The following sections explain the problems encountered, the benefits derived, and the possibilities for improvement. The transition was not easy nor was it inexpensive, but higher education in Florida is now more effective, serving more people, for just a few dollars more.

The Rationale for Using Big Media

Big media such as computers and television systems are more capital intensive than the traditional method of delivering instruction. Thus, not as much labor is required to deliver a given amount of instruction. Once the initial outlay has been made, there are no further increases in costs over the life of the equipment (except possibly for operating costs which are relatively small). These systems also have the advantage of economics of scale. That is, a computer can be purchased that will be ten times as fast, accomodate ten times more terminals or students than a smaller computer, but will not cost ten times as much to buy and operate nor need ten times the space. Also, computer software can be easily duplicated and disseminated once developed as can video-taped lectures or courses for television. Therefore, additional students can be added to the higher educational system with a small marginal cost.

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

Another advantage of computer-based instruction is that it is excellent for remedial work. Florida has tried to make higher education available to everyone who is interested and qualified but there are many who do not quite meet minimum qualifications, minority and disadvantaged groups included. A computer-assisted instructional course has the advantages of impartiality, repeatability, infinite patience, and availability day or night.

In addition, a survey of research on educational technology in 1974 found that computer-assisted instruction could decrease student learning time (3). This has been translated into cost savings through less time in school, less use of facilities and less need of supportive systems. Not only have time savings led to cost savings, but there has been an additional benefit of increased quality; quality here refers to increased curriculum variety, attendance and student morale. Therefore, increased enrollments have been met with existing physical plants and a slightly larger faculty rather than the major increase that would have been required by traditional instructional methods.

Instructional methods should be the outcome or product of two concerns: (i) the needs of students; and (ii) the practical and cost constraints on the system (including those arising from a chosen method of information delivery). Usually, it is not the pedagogic difficulties that cannot be overcome, but the administrative and organizational rearrangements that would be necessary in any given institutional system, if methods of computer or video teaching are to be optimized (4). Therefore, the flexibility of the Florida educational system and its willingness to change its basic structure of instruction to meet the demands created by a growing populace, new technology, and increasing costs, was crucial. The increased use of CAI and ITV has helped Florida meet these demands in higher education.

Instructional Television (ITV)

Instructional television was chosen to alleviate large crowded classrooms. It was found that students preferred small discussion classes to television classes but preferred television classes over large lecture classes (3).

A basic color television production facility costs a minimum of $1.6 million, not including land and building costs (5). For on-campus use, a full production center is not necessary. A co-axial cable or closed-circuit television system will deliver the signal for a classroom lecture to anywhere on campus. Video-cartridges are used to record special programs such as a lab experiment that can be viewed at any time in a library media center. For special productions the Educational Television (ETV) studios operating in the larger universities can be used.

ITV can be very economically attractive if the basic capital and operating costs can be assigned to ETV and only the marginal costs to instructional programs. The marginal production costs for ITV are about $1000 per hour (6). Once a program or course is developed, video-tape copies can be made and disseminated to every college or university in the state. Common course numbering facilitates interchange of video-taped program instruction and has the added advantage of making transfer of credit from institution to institution more meaningful.

ITV can be very economically attractive if the basic capital and operating costs can be assigned to mass distribution and only the marginal costs to instruction at the local level. The marginal production costs for ITV were about $1 million per year, based on a cost of $1000 per hour for 180 days for 6 hours per day (6). Thus, an hour of instruction once produced can be seen by every pupil, at the level for which the program is intended, anywhere in the state.

To make the ITV system work, the problems of developing a new instructional medium and exploring its potential had to be met in order to integrate content, schedule and format. Administrators, faculty and curriculum planners had to work together to plan the system and overcome regional differences, teaching philosophy and patterns of use. Also, to fully realize cost savings and to justify the high initial costs, the state had to insure adequate utilization of the system. Therefore, there must be enthusiastic teachers and planning at the begining of each year with ITV providing: (A) enrichment; (B) direct instruction; and (C) training for the professional staff (6). Training for the professional staff is required if ITV is to be used cost effectively.

The costs of ITV are as follows:

(A) Development costs -- these include planning, construction of any buildings, transmitters or equipment that are required;

(B) Production costs -- these include the costs of developing the courseware and producing the programs;

- (i) direct costs -- these are costs that increase as the number of programs increase;

- (ii) indirect costs -- "overhead" such as costs of maintaining buildings, equipment, salaries, services, etc.

(C) Transmission costs -- cost of delivering the electronic signal. Possible means include:

(i) open broadcasting;

(ii) cable-antenna TV (CATV);

(iii) video tape cartridge (VTC);

(D) Opportunity costs -- this is what is given up in order to purchase the system -- "the next best thing";

(E) Distribution costs -- none for open broadcast, CATV has rental cost, VTC mail or delivery charges;

(F) School hardware -- video recorders and receiver costs;

(G) School software -- costs of locally produced programs (4).

The various delivery sub-systems (i.e., open broadcast, cable, videotape recorder, and videodisk) each have a unique advantage. The open broadcast system, once in place, can be received by a practically limitless number of receivers within its range. Thus, the local populace can receive programs in their homes as well as in the schools. A disadvantage is the limited distribution of CATV, especially in remote areas. Video tape is very inexpensive and can be wiped and used again -- up to 250 times; it can also record off-air and be played back later, thus giving more flexibility. Disadvantages are one-way programming and, if not produced locally, delays in delivery.

Typical video tape system costs are:

(A) Live one-hour course -- programming and production costs -- from $10,000 to $70,000;

(B) Copied programs -- from $1200 to 1500/hour (4).

The programming costs may seem high but even taking the high cost of $70,000 and spreading it among 100,000 students gives a per student cost of 70¢; and if it is used for five years the cost drops to 14¢ per student per hour.

Research has found that ITV can teach all college levels and subject matter about as effectively as traditional instruction (9). In the early studies, though, only the medium of instruction was changed. New methods of instruction using mixes of technology were implemented later and found to be much more effective.

It was decided that ITV programming would be implemented, when possible, in courses with large lecture classes.

ITV is not a panacea but it has been effective in holding costs down while providing quality instruction. It is not useful in every situation, but has helped to eliminate large lecture classes and to make certain specialized courses available to even the small colleges, which could not afford to keep specialized professors on their faculty.

Computer Assisted Instruction (CAI)

Computer assisted instruction had been used very rarely prior to 1970, mainly in universities. CAI, like ITV, was first used as an "add-on" to traditional instruction. This did nothing to save money even though it did improve achievement (3). A report in 1975 which looked at fifteen examples of CAI approached the problems stated earlier in terms of instruction productivity (7). Instructional productivity was defined in terms of inputs, production and outputs as follows:

I. Inputs (added to regular instruction)

   Computer programs
   Data bases
   Materials
   Students
   Tests

II. Production (related to computer applications)

   Analyze/Relate data
   Evaluate responses
   Perform computations
   Prescribe activities
   Provide questions
   Test performance

III. Output (above regular instruction)

   Cost avoidance
   Course content
   Student enrollment
   Student efficiency
   Test results

The report reached four conclusions:

- Growth of instructional computing has been justified as an added cost at the level of individual classes or courses without displacing labor or other costs.
- Instructional productivity can be identified at that level in qualitative and/or quantitative terms which show contributions of computer technology.
- Justification of instructional use of computers can be made in those terms by relating added inputs with the computing to added outputs due to the computing.
- The above approach offers promise for advancing instructional use of computer technology during the next 2 - 3 years and deserves the support of many more academicians documenting/

disseminating results (productivity) from using computers in their courses (7).

Here, as in other studies, CAI saved up to a third of the student's learning time as compared with traditional instruction, without a decrease in effectiveness. Another emphasis here, as elsewhere, was that the technology augments human effort, increases the productivity of teachers, and does not replace them completely (3).

In a study done for the DOE in 1977 the computer capabilities of the county school districts were studied (8). The report recommended that the existing systems be upgraded and expanded so that every district would have equitable access to computer services. Further following the recommendations, eight regional data centers were established with full administration and instructional applications available to every district. A second study was made on the higher education system. It recommended that existing regional data centers be expanded and new ones established to fill in any gaps. Also, if possible, that the higher education data centers tie-in with district school data centers or where feasible become one and the same.

The many potentials for cost reduction put forth in another study have been realized (9). These are as follows:

- Mainline CAI can cost less than $1.00/student contact hour (SCH);
- A school system can share computer costs, e.g., administration, CAI, continuing education, adult education, city and county governments;
- Economy of scale can be reached through manipulation of number of terminals and/or average usage;
- Mass distribution of software can spread costs;
- Multiple use of programs is just as logical as multiple use of texts;
- Course development costs decrease as authors obtain experience with CAI;
- Software development as part of theses and dissertations is a source of cost reduction;
- With stable content areas, number of students (for assigning development cost, etc.) can be spread over several years;
- Superimposition of CAI on a computer installed for other purposes reduces the cost of CAI;
- Standardization of format promotes transfer of material;
- Networks and consortiums can spread costs (9).

Large computers have the advantage of economics of scale, i.e., the larger the facility, the smaller the per unit cost of production. A large computer does not take proportionally larger facilities and staff than a small one. Since large computers can handle much larger workloads, eight regional data centers were established in the state based on the DOE study. These centers were located at the universities except Florida A & M which had access to FSU computers across town. This distribution also gave the 28 community colleges access to complete computer facilities for very little additional cost to themselves.

Computer-assisted instruction has important advantages in use as direct instruction. Faculty morale is improved because they have more time available for personal attention and are, therefore, better able to treat the students as individuals. There can be more course offerings---a course that is developed for one quarter can be stored and made available in subsequent quarters. The quality level of the instruction can be improved through CAI. The student can receive individualized instruction with immediate reinforcement. A computer presentation is consistent and infinitely patient with a slow learner. There is controlled interaction, the student must respond individually, therefore, he/she cannot sleep, skip ahead, or cheat. Complex handling of materials is possible and responses can be timed. The assessment of the student's response is accurate, consistent and rapid. Most important, there are quality materials, the most capable and knowledgeable instructors can be used to design the programs and the courses can be improved and updated when necessary. The above aspects help improve student motivation and confidence. The possibility of around-the-clock accessability is convenient to the student. Faculty time can be freed for a more personal role because there will be less teacher test preparation effort, reduced time to score tests, as well as complete student records and diagnosis.

Through the above advantages and benefits, a larger student group can be given quality higher education and receive more personal attention. In the traditional system more teachers have to be added if more students are added; larger enrollments have also been handled by increasing class size but this also increases impersonalization.

Since most of the higher education institutions in Florida already had fairly extensive computer facilities, the move to more computer-based instruction had to begin with the assessment of capabilities. Capabilities were then compared with the desired hardware requirements. The additional expenses for instructional use were marginal costs since the existing systems could be expanded. The smaller colleges which could not justify major computer systems were allowed access to the nearest university system. The continued decline in data processing systems cost should enable even the smallest school to eventually have its own in-house computer if it so desires.

Conclusion

The increased use of technological applications in Florida's system of higher education has helped the state to meet a rising student population and rising costs. Instructional costs have leveled off because more faculty have not had to be added to meet needs created by increasing student enrollments.

Others who are considering the use of ITV and CAI to reduce instructional expenditures should be made aware that high "front end" costs are involved for acquisition of hardware systems and development of instructional courseware. Costs analyses (10) indicate that ITV and/or CAI systems must be used from 10-15 years in order to achieve true cost savings. This long term commitment is required in order to be able to prorate the high "front end" costs over a large enough number of students over a long enough period of time. In this way, unit costs of instruction can be brought to a level lower than would be possible under traditional labor intensive instruction. Half-hearted commitment to use these technological applications can only result in increasing costs as well as creating the possibility of wasting valuable resources.

One other area of concern that others should be aware of is that curriculum diversity is initially reduced when large scale hardware-based instructional systems are used (11). This is most evident when the first set of courseware is being developed. Quality courseware takes time to produce thus limiting the amount that can be available for use during the beginning stages of hardware-based instructional delivery systems. In addition, ITV and CAI materials must be used with large numbers of students in order to achieve economies of scale and ultimate reduction of unit costs to acceptable levels. Over time, however, we can accumulate a wide range of ITV and CAI curriculum materials thus enabling us to provide a range of curriculum diversity that would not be possible under traditional, labor intensive instruction.

The amount of high quality instructional courseware continues to increase because credit is given to faculty for instructional development. We have accomplished this by establishing a system of incentives to enlarge the number of available programs in almost every area. It takes time and a deep commitment to reap the benefits that we have been able to achieve in Florida through the application of ITV and CAI.

At this point in time we can document that faculty members have become more productive while also being able to give more personal attention to student needs.

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Chapter 4

BETTER SCHOOLS MAGAZINE

THE EDITOR'S PAGE

BETTER SCHOOLS MAGAZINE, November 1986, Vol. 20, No. 11

The State of Florida is celebrating a success while many other states are anxiously waiting to hear its final story. After ten years of redesigning educational programs and redefining the roles of professors, the state can now say that it has a better higher education system. Not only can it claim more effective colleges and universities, but it can also boast of lower educational costs. In this special issue of Better Schools, field reporter Nancy S. Mengel relates Florida's success story to show how higher education institutions improved their programs during the ten year period from 1975 to 1985 and reduced costs at the same time. If it is not too late already, the Florida Plan described in these pages could easily contain solutions to avoiding the financial crises many states are facing or will be facing in the near future as the cost of providing education rapidly exceeds the ability of present revenue structures to provide adequate support.

RGS

A COST REDUCTION PLAN: PERSONALIZED, MULTI-MODE, COMPETENCY-BASED DEGREE PROGRAMS, A SCENARIO

Nancy S. Mengel, Field Reporter

THE PROBLEM IN FLORIDA IN 1976

In July, 1976 the strategy planning staff of the Florida Department of Education had made public its finding on the projected enrollments, expenditures, and revenues for public education in the state over the next ten year period. It became apparent to everyone that public education would take up an increasingly larger piece of the state's general revenue "pie." At that time, public education in Florida accounted for 60% of the state's general revenue expenditures and by 1980, it was projected that it would account for 74%. If this trend were to continue, it would account for 86% in 1985. (1, p.1)* A few foresighted people in the field of education, taxpayers, and legislators angrily expressed their opinions. "This trend must stop. We will not stand for it. We cannot and will not swallow the idea of paying for such a large piece: it will have to be made smaller."

The reasons for this revolt can be found in the mood of the times--one of frustration over educational productivity. Students, parents, and taxpayers were making demands for accountability and humanism in education. No group was better at expressing this mood than the college age youth who wanted their education to help them realize the American Dream--equal ability for all to acquire the better, higher paying jobs in society. They felt this could only be a "promise kept" if the institutions of higher education were accountable--for money, resources, and learning outcomes--and at the same time, were humanistic in their role of educating the whole person. In 1976 the students, their parents, and the taxpayers wanted to know about this product called "higher education" before they bought it. As a result, they asked questions.

> What return will we get for our money?
>
> How is our money going to be spent?
>
> Will the student come out of this program with the basic skills required to survive in this society?
>
> Will he or she have attained the competencies required to successfully pursue the vocation or profession of his or her choice?

They also wanted to know about the quality of the product in more than dollars and cents terms. They wanted education to be personalized and humanistic. They wanted access to the ideal of American higher education--face-to-face, individualized learning experiences.

Thus, in 1976 a problem had manifested itself. The citizens of Florida wanted better schools for less money, and they found themselves faced with the dilemma of having to reduce costs and increase educational productivity at the same time. They would have to find a way to give "more for less."

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents may be found at the end of this chapter.

CHOICE: REDESIGN THE SYSTEM OR FAIL

The state general revenue expenditures for higher education were projected to be 61% greater in 1985 than in 1976.* The greatest growth was anticipated in the community college sector, but all institutions of higher education would see a significant increase in costs. The major factors affecting the increases in the community colleges other than inflation were the growth of the adult population, the expansion of programs required to serve a larger proportion of the adult population, and higher dollar amounts spent per student (1, p.8). Educational planners felt that these increased costs should be kept at a minimum without having to resort to extreme "band-aid" measures such as capping enrollments. They believed that the state's general revenue expenditures could be greatly reduced if efficiency was increased by redesigning the system to include new, cost saving features such as eliminating faculty positions and increasing pupil-teacher ratios, reducing the proliferation of class offerings, and using facilities, equipment and material more intensively. One way of getting at all of these cost factors was through time. If students could complete their degree program in 80% of the usual time required to do so, a 20% savings could be realized in instructional costs (2). The savings could be produced by eliminating faculty positions and by meeting the demands posed by increasing enrollments and expanding programs in the community colleges with a more intensive use of remaining faculty and existing facilities and equipment instead of by the expansion of these significant cost factors.

With these goals in mind, the State Department of Education conducted a number of studies to try and find the best ways for achieving savings in time without decreasing effectiveness. These studies revealed that this could be accomplished if soft technology and various applications of low-cost, little media were used in individualized learning settings. These studies attracted the attention of Florida legislators and educators because they included three key elements of their problem of providing more for less: individualized, effective, and low-cost learning programs.

After conducting research on all of the effective uses of soft and low-cost, hard technology, they developed a plan which consisted of the best features of all known successful applications. By combining the use of little media (slides, audio and video tapes, programmed instruction, etc.) with computer-managed instruction, a statewide plan called "Personalized, Multi-Mode, Competency-Based Degree Programs" was developed for institutions of higher education.

THE FLORIDA PLAN

The Florida Plan can best be described by breaking it down into three parts: personalized, multi-mode, and competency-based.

A PERSONALIZED DEGREE PROGRAM

In this new learning program, the student comes closer to the ideal one-to-one, teacher-student relationship than ever before. Through the use of various types of

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*Our staff economist predicts a total general revenue expenditure of approximately $637.7 million in 1976 constant dollars for higher education in 1985.

MYTHS ABOUT TECHNOLOGY

One of the most interesting discoveries made by Reporter Mengel in her investigation of the Florida Plan was the wide variety of perceptions which people hold toward "educational technology." Many people tend to view it as "things" such as computers, televisions, and audio/visual equipment. Professionals in the field, however, make careful distinction between technology as a problem solving and design process, often referred to as "soft" technology, and the technological applications that are commonly associated with instructional hardware usually referred to as "hard" technology (4).

Another perception which was widely encountered is that technology is dehumanizing. Again, professionals in the field see this as a misconception and point out that humans make the decision to design technological applications which result in dehumanization. They assert that dehumanization is not an intrinsic feature of technology unless designers and decision makers choose to make it that way. Florida's decision makers chose to design individualized, accountable learning programs through the use of "little media." Their selection of "little media" was based on the results of a needs assessment which revealed that low-cost, simple to implement, humanistic programs could be developed using PI and easily transportable audiovisual equipment (as opposed to "big media" such as computers and television which can reach large audiences but are more expensive and more difficult to implement).

media and the guidance of peer tutors, graduate assistants, and faculty, he or she receives individual attention and high quality instruction. Students' courses are designed by teams of professors, instructional designers, media specialists, and educational psychologists. A variety of cost-effective instructional modes are used to provide the diversity of learning experiences required to achieve the general and specific outcomes of each program.

Relatively few classes are taught by professors in large lecture halls. Instead, most learning experiences are managed by professors with the help of graduate assistants and undergraduate tutors and are delivered in the form of modules, personalized systems of instruction, and audio and video tutorials.

Face-to-face interaction with a competent and qualified "manager of learning" is a part of all courses, but the nature of the contact depends on the level and content of the course. Most of the low-cost modular courses which offer little face-to-face contact with faculty are for lower level, introductory and survey classes that can be completed with the help of competent peer tutors who have demonstrated mastery of the course objectives (3,4,5). Higher-cost small group sessions, directed independent study, and field experiences requiring greater expertise are managed by instructors and professors (6). Thus, no matter what instructional mode is employed, all degree programs are personalized in that there is a great deal of individualization and one-to-one guidance in the learning process.

MULTI-MODE DEGREE PROGRAMS

A variety of instructional modes are used in all of the degree programs. Each program includes a mix of course offerings in the form of modules, audio-tutorials, video-tutorials, personalized systems of instruction, directed independent study, small group sessions, large lecture sessions, field experiences, and computer-managed instruction. Each program has been designed to produce the most cost-effective mix of media by using those applications of low-cost technology which can best help the student acquire the outcomes of his or her competency-based degree program.

The choice of instructional modes for a course depends upon the nature of the learning task. In courses like art history and biology where visuals can be employed to enhance learning, filmstrips, audiotapes, slides, and three-dimensional objects are used. But unless visuals are necessary for learning to take place, they are not incorporated into the development of the learning experience since it has been found that in these situations, the use of visuals will only serve to distract the learner (7). This fact and the fact that what makes a difference in learning is not what media are used but how the media are used (8) have been major assumptions that have guided Florida educators in the development of the courses for the new degree programs. While taking into consideration concern for humanism, they have used programmed instruction (PI) with little or no supplemental media as much as possible when designing courses because courses offered in the form of PI modules that do not require the use of slides, filmstrips, audiotapes, or other low-cost media are the most inexpensive ways to deliver quality learning programs (6). Since the use of PI produces significant savings in the learners' time, it has proven to be the most cost-effective mode that can be used to replace traditional instruction (4). After conducting a detailed examination of the various modes used in the Florida Plan, Reporter Mengel compiled the following description of the main features of each of the different approaches to learning.

Modular Units

- Programmed units managed by competent, peer tutors and graduate assistants of approximately a week's duration.
- Self-contained learning packages which include objectives, materials, and means for self-assessment.
- Self-paced, mastery learning packages.
- Units that can be completed at home utilizing little or no audio-visual equipment other than inexpensive items such as tape cassette players or can be completed at the Learning Resource Centers when more expensive and diversified audio-visual equipment is required(9).

Personalized Systems of Instruction

- Modular units of instruction that must be completed with the assistance of peer tutors who provide testing and tutoring services (5,6).

Audio and Video Tutorials

- Self-paced, mastery learning units which must be completed in the Learning Resource Center.
- Use of audio-tapes and other types of low cost media such as slides, three dimensional objects, and lab equipment.

- Small group quiz and discussion sessions for each unit that are managed by instructors or professors.

- Large group lectures or assembly sessions that are managed or taught by instructors or professors (3).

Directed Independent Study

- Directed or supervised independent study conducted under the guidance of a professor.

Lecture

- Traditional lecture class.

Field Experiences

- Internships, student teaching, and other work experiences that provide the students with direct experiences in business, government offices, or public institutions.

Computer-Managed Instruction

- Testing on both the general and specific program outcomes is managed by the computer.

- Students must take these tests in an Assessment Resource Center.

- Students fill out special test forms which are located by a clerk and graded by the computer.

- The computer provides prescriptive feedback, performance status on objectives, and certification of mastery of objectives (10).

COMPETENCY-BASED DEGREE PROGRAMS

The competency-based degree programs consist of the following outcome oriented features:

- Clear cut statements of learning outcomes.

- Instruction designed specifically to bring about these learning outcomes.

- Individualized and self-paced courses.

- Mastery learning requirements to assure competencies have been achieved.

- Assessment of general education outcomes in the form of standardized COMP tests (11). These tests measure the following outcomes that are common to all programs: communicating, solving problems, clarifying values, functioning with social institutions, using science and technology, and using art.

- Assessment of specific outcomes (content) for each course in the form of tests designed by the instructors and professors managing the various courses.

THE LEARNING ENVIRONMENT:

The classroom is no longer the center of activity in the new system. It has been replaced by the Learning Resource Center. In order to minimize the increase in costs of additional facilities and equipment that had to be provided for a growing student body in the community colleges and for new facilities and equipment that were required to implement the Florida Plan in the universities, the institutions of higher education adapted existing facilities to meet the requirements of the new system. The library on each campus was converted to a centralized, multi-media, learning resource center. Academic subcenters were set up in each building. To accomplish this many structural changes had to be made in campus buildings. Classroom walls were torn down and these rooms, along with other adaptable ones such as dining rooms, were converted into large learning resource centers. Each student has sufficient access to these resource centers because the hours are such that the main center in the library is open twenty-four hours a day and the subcenters are open sixteen hours a day.

The Assessment Resource Center is part of the main Learning Resource Center on each campus. It consists of a large room or series of rooms with rows of carrels that provide individual, private testing facilities for the students. The Center is staffed by clerk(s) who locate the test materials for the students and by a computer that manages the learner-centered assessment. "When a student arrives at the Center, the computer uses its record files to select the appropriate test instrument to be administered to the student. After the student completes this test, the computer immediately scores the test, provides the student prescriptive feedback, and updates its record files. The computer allows each instructor to request a current student status report from remote terminals. The computer also provides the Center staff with various utilization and performance reports. Through the utilization reports, the computer is able to estimate Center usage for a specified time period, predict which test instruments will be administered, and project the effects of incorporating additional assessment activities within the Center" (10).

NEW ROLES FOR PROFESSORS AND STUDENTS

ON-THE-SCENE COMMENTS ABOUT THE NEW SYSTEM

We visited with students and faculty on the various state campuses to find out about how the new programs worked for them. The following pages summarize what we learned.

A TALK WITH STUDENTS

INTERVIEWER: How does the audio-tutorial method compare to the old lecture-lab method that was used for science classes?

UNIVERSITY UNDERGRADUATE BIOLOGY STUDENT: The audio-tutorial lessons I receive in the Learning Resource Center in the Biology Building offer higher quality and more personalized instruction than the old lecture-lab method. The center is open sixteen hours a day so I can work through the taped lessons any time during the week at my own convenience. An undergraduate tutor who has already successfully mastered the course is always there to help over the trouble spots. Once a week I attend a small group quiz and discussion session with nine other students and my professor. Once I feel I have mastered the material in a unit, I go to the Assessment Resource Center and take the unit test. I get immediate feedback on my performance and if I do not make the required score, I am given guidance on what objectives I have to restudy. This is great because I can restudy and take another test at my own convenience--the very same day if I want to. This self-paced, flexible schedule is giving me the opportunity to complete my course work more quickly. In fact, I will graduate next quarter, having completed the B.S. degree program in biology in eight quarters instead of the usual twelve it would take to finish under the old system.

Although I think it is great to have moved through the system in three years, there are aspects of the old way of getting a higher education that I miss. Sometimes I miss the anonymity of not being known or seen by my instructor in large classes. Greater demands are placed on me now to exercise initiative and responsibility for my learning experiences. Under the old system I did not feel the continuous pressure to keep going at a steady pace, but I guess I am better off now even though I have to work harder.

INTERVIEWER: Has anyone else realized these time savings and if so, is your education costing you less than it would have under the time bound system?

COMMUNITY COLLEGE MATH STUDENT: Many of my courses have been delivered in the form of programmed modules that I have been able to complete at home. Thus, I have been able to carry a full-time job during the day. Since we pay for our education by the credit hour, I do not save money on the cost of my education under the new system. I do save in a sense, though, because I can work and go to school at the same time. In fact, in order to find a job I had to move from Orlando to Tampa half way through my degree program. Under this new system the move presented no problem because the required outcomes of my degree program are standardized statewide. I was able to pick up right where I left off, and all of my credits transferred. Since I had received my credits on the basis of my performance, I was not left behind by the transfer.

INTERVIEWER: I see that a great deal of your college education will take place with little required personal contact from your professors. Can you really say that the quality is better when only some of your courses provide interaction between professor and student?

UNIVERSITY STUDENT TEACHER IN ELEMENTARY EDUCATION: I am presently doing my student teaching in a local elementary school. I see my faculty supervisor one to three times a week, and I get constant attention from my cooperating teacher. All of the degree programs require a field experience or internship where this kind of personal attention takes place. The best way to describe the personalized, multi-mode, competency-based program is to compare it to taking a trip through Disney World. Each course is an adventure in learning. Participating in each different type of learning experience whether it be a take-home module, audio-tutorial, directed independent study, or large group lecture is like buying a ticket to one of the adventures in Disney World. When you go to Disney World you have to pay a higher price for the really "big" adventures. Face-to-face teaching is really a "big" adventure. You have to pay a higher price for this type of learning experience. As a result, to keep the cost of education reasonable for both taxpayers and students, this type of learning experience is offered less frequently than the more cost-effective ones. What is really important is that since the programs are personalized and competency-based, all courses offer a high quality adventure by providing a mix of media with "human management of learning." No matter what mode is used, the professor (the expert) is still providing and controlling the learning experience whether it be in person or through the use of media. I still can see the instructor and when I do, it is on a one-to-one basis. I get more personalized experiences now.

INTERVIEWER: Am I correct in concluding that from what you say your education is one of higher quality because it consists of a mix of human expertise and media working together in the most cost-effective ways to help students learn?

STUDENT TEACHER: Yes, you are.

COMMUNITY COLLEGE HISTORY STUDENT: Learning from a variety of instructional modes is more effective than learning in just one way (8). The media can be combined to provide the optimum learning experience for each situation. I just completed a course in twentieth century American history which was delivered in the form of an audio/video tutorial. I went to the Learning Resource Center to read the texts, listen to the tapes, and view the movies that covered the content of the course. The small group sessions with the professor provided the opportunity to clear up misunderstandings and to become involved in discussions. Before I transferred to a Florida college, I attended an out-of-state school where I took a similar course that was delivered in the form of the traditional large lecture class. I successfully mastered all of the course material in the Florida course, but I can honestly say that I did not in the out-of-state course. Not only was it frequently boring but there was little time for discussion or questions and no relief from the monotony of lecture.

INTERVIEWER: I guess we can say that the new system in Florida is meeting your needs much better than the old one did.

A TALK WITH THE FACULTY

INTERVIEWER: Under the new system, the professor is no longer a storehouse of knowledge sitting in his ivory tower waiting to share his information with the rest of the world. How would you describe the new role of the professor?

COMMUNITY COLLEGE ENGLISH DEPARTMENT CHAIRMAN: The role of the college professor has been redefined. I guess the best way to describe it is that now he is a manager instead of a boss of the student's learning experience. The lecture podium has been replaced with the study carrels in the learning resource centers. There may be twice as many students, but his contact with individual students is actually greater than it was before. For example, the introductory courses that I taught in large lecture classes in the old system have been developed into modules. My undergraduate and graduate assistants provide students with help on these modules whenever they require it. As a result, I spend more time conducting small group sessions and independent studies than I did under the old system. Both are more satisfying experiences for me than the old, large, lecture classes in terms of my interactions with my students, but I do miss writing and delivering my lectures.

INTERVIEWER: But don't you have to spend a great deal of your time in course design and development?

UNIVERSITY HISTORY PROFESSOR: No, now that the transition period is over. Some of the courses in the department have been standardized statewide in terms of both method and outcomes. I worked as part of a team in developing a few of these courses. The courses that I am personally responsible for are being taught in the form of personalized systems of instruction in the Learning Resource Center. The faculty in each department can choose the instructional mode(s) they want to use in designing their courses as long as they meet the budget requirements and as long as their lessons produce the standardized learning outcomes. The development of these courses required a great deal of my time, but now that they are working well and only have to be revised occasionally, I have much more time to devote to students and research than I ever had before.

INTERVIEWER: You mentioned you have more time to devote to research. How did your neglect of research work affect possibilities for advancement and for getting tenure?

UNIVERSITY HISTORY PROFESSOR: There was no problem with advancement and tenure since the State University System now rewards us with promotions and salary increments for our successful endeavors in course design. These incentives are the culmination of ten years of reform that began back in 1973 when the Omnibus Education Act was passed. This bill provided that faculty could not be denied promotions, salary adjustments, re-employment or tenure solely for the failure to do research. It also required that quality teaching should be recognized and reinforced and considered a major factor in determining promotions and tenure. By encouraging innovations in instruction, it began the move toward the establishment of the state instructional innovation grant fund that is our major incentive for putting extra efforts into course design today (1). Also, now that I have time to do more research, I have found my employment prospects are greatly improved on the national market because I can offer expertise in two areas: research and innovative course design. I have options now, and I feel more successful.

INTERVIEWER: With all of these individualized systems of instruction, don't you find yourself spending more time grading papers and tests?

COMMUNITY COLLEGE BIOLOGY PROFESSOR: Actually, I spend less time on these chores because I have designed most of my courses so that they can be tested in the Assessment Resource Center. The competency-based program requires explicit statements of objectives that must be mastered by each student if he is to master the course and meet the requirements of the degree program. These objectives were used as the basis for developing the criterion-referenced tests required by the computer-managed testing system. Since different assessment procedures have to be used to evaluate attainment of problem-solving and creative competencies, we also use small group sessions for evaluation. Otherwise, the Assessment Resource Center does all of the assessment work including that of providing feedback and remedial help when I want it to be that way.

INTERVIEWER: Do you feel that you are providing higher quality learning experiences at lower costs?

UNIVERSITY DRAMA PROFESSOR: Definitely. I can best address this question on cost savings by comparing the professor to a performing artist. The "live performance" given in the small classroom costs the most, then comes the one time showing of the "live performance" in the lecture hall. If more than one showing of a lecture has to be provided to reach the entire audience, it becomes cheaper to mediate the lesson. Just as most people prefer the comfort and low cost of listening to or viewing the performing artist in their homes on radio or television, many students prefer the convenience of the tutorials in the resource centers or modules that can be completed at home. What students miss is the "comfort" of the lecture hall--just sitting back and relaxing while the professor does the work. In this new system, they must be actively involved in learning. When working on a module or a tutorial, you cannot just sit back and relax. You have to be diligent and work hard.

INTERVIEWER: The Florida Plan realized much of its cost-savings through the elimination of faculty positions. How did the faculty in the state university system react to these massive lay-offs?

UNIVERSITY DRAMA PROFESSOR: Naturally, their reaction was not good. The union took the original termination notices to court to challenge them, but after a painful series of legal struggles, the courts ruled in favor of the State University System. Bitter feelings still exist in the professional community, but the required adjustments are gradually being made.

INTERVIEWER: In the final analysis, it seems that the remaining professors now have the opportunity in the new system to excel professionally as both experts in research and experts in guiding and promoting student learning.

COMMUNITY COLLEGE ENGLISH DEPARTMENT CHAIRMAN: This is true. Surprisingly enough, we now have the time to do the best job we can in all areas of professional responsibility even though our responsibilities have increased greatly as a result of the reduction in faculty numbers.

THE FLORIDA PLAN FOR LOWERING EDUCATIONAL COSTS

The Personalized, Multi-Mode, Competency-Based Degree Programs have much to offer in the way of reducing the costs of higher education. Over a ten year period, the state of Florida reduced its instructional costs by more than 20%. The largest savings were seen in the following areas: faculty salaries, instructional materials, and facilities and equipment.

The reduction in faculty salaries came about due to the elimination of faculty positions and to savings in instructional time which resulted in additional savings in instructional costs through:

- Elimination of small class offerings at the universities.
- Using programmed instruction to move students through the system more quickly so new faculty would not have to be hired as enrollments increased in the community colleges.
- Using, personalized, multi-mode programs with standardized learning outcomes to meet the demands posed by the requirements for expanding programs and for more faculty in the community colleges.
- Using computer-managed instruction for assessing students performances on the objectives of the learning packages to relieve professors of the burden of designing, scoring, and providing feedback for tests. This permitted professors in all institutions of higher education to carry a larger class load or to redesign courses based on more interaction and performance of students.

FLORIDA'S PLAN FOR SAVING INSTRUCTIONAL COSTS BY ELIMINATING FACULTY POSITIONS IN THE SUS

In her talks with educators and legislators throughout the state, Reporter Mengel discovered that although the decision to cut back on the size of the State University System faculty was not an easy one, it was the only way Florida could go to reach the goal of 20% cost reduction by 1985. This was due to the fact that instructional costs comprised the largest amount of the state's expenditures for higher education. If they were to be reduced, less money would have to be spent. Since the attrition rate of the SUS faculty was not great enough to bring about cost reduction by the elimination of vacated positions, the only alternative was to reduce costs by laying off faculty and abolishing positions accordingly. This was accomplished by requiring each college and university to identify its particular strengths and weaknesses in terms of its academic programs. These institutional profiles were then analyzed by the planning staff of the Board of Regents in order to determine which program could be eliminated on a particular campus without totally eliminating offering of the program on at least one of the SUS campuses. This was to ensure that the SUS, taken as a whole, would offer a representative set of academic training programs within the State of Florida such that no Florida resident would ever have to leave the state in order to enroll in the academic area of his or her choice. It did mean, however, that a student might have to go to a college or university at a greater distance from his home residence because not every institution would offer the same academic program as every otner institution.

Thus after determining:

- *Student demands for programs by institution*
  and
- *Which academic programs in a given academic area were strong and which were weak at each institution*

decisions were made as to which programs could be eliminated within each college or university. Programs identified as weak were defined as lay-off units and faculty in them were given termination notices.

- Combining all the techniques described above to facilitate the reduction of faculty required to implement the cost-saving learning programs throughout the state

The cost of developing new instructional materials was minimized by using readily available materials and by adapting already existing materials in many courses. This greatly reduced the amount that had to be spent on R & D in the transition period. Once the materials were available, they were used on a statewide basis. With this statewide sharing of many instructional materials, there was an increase in demand and an accompanying decrease in costs.

Access to the learning resource centers was made easy by using extended hours. As a result, facilities and equipment could be spread over a much larger group of students than was ever possible under the old time bound system. Thus, once the initial additions were made, facilities and equipment did not have to be expanded as enrollments increased. This more intensive use also helped students to move through the degree programs more quickly.

Under the new system in Florida many students are better able to pay the increased costs of their education because they can arrange their schedules to accomodate their jobs. The fact that a majority of the students are completing high quality degree programs in less time is cost saving to both the student and the taxpayer. Finally, an additional savings for the taxpayer is made possible by requiring the field experience in all degree programs because it removes the student from the campus for one quarter without removing tuition fees.

A SUCCESS STORY: WHY THE FLORIDA PLAN WORKS

The Florida story differs from previous success stories because it is the first attempt to reduce costs by using soft technology and low-cost, little media in order to redesign the system on a large scale basis.* It can attribute its unique success to the following:

- By standardizing many course offerings and sharing instructional materials statewide, the Florida institutions of higher education shared the initial add-on costs of the new technology. Also, the use of standardized materials resulted in an increased demand for these materials and with an enlarged market, their costs were greatly reduced by the end of the ten year period.
- The large lecture hall method was retained whenever it was most cost-effective to do so (13). Also, PSI classes were only used when enrollments were large enough--over 50--to realize cost savings (6).
- The system was redesigned to permit self-paced, take home study. This allowed more students to hold jobs and in turn, it helped them to bear the burden of the cost of their education.
- The development of the Assessment Resource Center (ARC) saved professors time by relieving them of the burden of scheduling, testing, and providing feedback. By foregoing the option of using terminal-oriented CMI--which requires that tests be taken at the terminals instead of by filling out special forms in carrels--additional cost savings were realized.**
- By requiring a field experience for every degree bound student, the schools were relieved of the burden of providing education for a quarter while still receiving tuition fees.
- Florida did not choose to use heavy, high cost technological applications when redesigning its system because cost savings could not be realized within

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*See p. 13 - The "Mini" Forerunners of the Florida Plan

**The ARC is approximately 10% as expensive as terminal oriented testing facilities because it can serve more students at one time and it does not require large investments in hardware.

THE "MINI" FORERUNNERS OF THE FLORIDA PLAN

The personalized, multi-mode, competency-based degree program is truly a landmark in the reform of higher education. Many institutions of higher education had experienced similar successes prior to the implementation of the Florida plan, but none were as notable because they did not witness success on such a grand scale. The "mini" forerunners of the Florida Plan that are described below provided the impetus that was required back in 1976 to get the whole project rolling.

In 1969, Postlethwait (3) of Purdue University had demonstrated a 2/3 savings in faculty instructional time by using the audio-tutorial approach for teaching biology. He also claimed personnel savings by using one instructor of faculty rank, one regular instructor, ten half-time teaching assistants, and one half-time secretarial help to teach 600 students.

James E. Stice (5) reported savings using the Keller plan of personalized systems of instruction. He noted that if tutors are not paid and low cost technology is used, initial costs can be kept low and will decrease with time. Stice reported that Moore (5, p. 35) analyzed the costs of four junior-level courses in upper division mathematics and physics taught by PSI at California State University in 1973. His analysis included faculty, proctor, and physical plant costs. Moore reported a 50% net savings for the PSI courses due to decreased professional and physical plant costs. Stice also noted that Herring demonstrated "that a well-developed PSI course with good materials can be taught effectively by a lower-ranking (and lower salaried) teacher with additional savings" (5, p. 36). Gleeson noted that not only is the cost in faculty salaries for a large PSI physics course about 1/2 the cost for ordinary lecture-lab, but additional savings can occur by using lab equipment more intensively (5, p. 37). Finally, Bowen & Douglass reported that there must be a "break-even" class size of 50 for the PSI plan to cost no more than normally sized conventional classes (6).

The Oklahoma Christian College produced a cost saving ". . .record of productivity per faculty member of some 827.3 student credit hours by using low cost technology in a learning resource center. This was some 250 hours more than was claimed by the highest ranking institutions among thirteen liberal arts colleges compared in a recent study by the Council for the Advancement of Small Colleges" (6).

The STAR investigation team of the Instructional Systems Development Center, Florida State University, conducted a review of the literature on cost-effective applications of educational technology in the fall of the 1976-77 academic year and reported that programmed instruction can result in savings of 33 1/3% of learner time (4).

the ten year period, 1975-85. Fifteen to twenty years would be required to accomplish this goal.

- Florida gave the plan enough time to work. It did not give up early in the game when it was faced with the problems of the transition period.

WAITING IN TRANSITION: NOT AN OVERNIGHT SUCCESS

The Florida plan had to overcome some seemingly insurmountable problems during the period of transition. Faculty had to develop new courses at the same time they had to develop plans for teaching conventional classes. They had to be provided with the incentives to spend more time on "teaching" and less on research. The amount of time required for course development was greatly reduced by developing learning packages for statewide use, by buying commercially available materials that had proven to be effective, by using media specialists and instructional designers that were already on the staff, and by adapting existing materials whenever possible. In addition to this, the use of graduate assistants to help with the design of conventional and new courses helped to make the transition a smoother one for the faculty.

All of the faculty had to be trained to meet the responsibilities of their new roles. By providing this training and by using previously underutilized instructional designers and media specialists who were already on some staffs to assist in course development, both the disaster of creating low faculty morale and unsuccessful courses was prevented. Faculty resistance to the new system was reduced and money was saved in the long run because the faculty was provided with sufficient incentive to accept their new roles and sufficient help to make the whole thing work right in the first place.

Special degree requirements had to be developed for students who were mid-way in their programs when the new system was implemented. Also, since the student had to assume new responsibilities, he had to learn how to operate successfully in the new program. For many students, this was a problem at first. It took them much longer than was anticipated to get through the PI courses. But once they experienced the new modes and were able to perfect new approaches to learning, most of those who had difficulty initially were able to overcome it and to realize time savings.

Finally, the most difficult problem that had to be overcome was to convince the people of Florida to give the plan a chance to work. This was due to the fact that savings did not accrue immediately because the funds freed up by laying off faculty had to be used at the outset to design and develop the personalized, competency-based, multi-mode degree program. In addition, these funds had to be used to purchase large amounts of learning materials and the "little media" required to equip each of the many learning resource centers that were required to deliver instruction to students on an individualized basis. For the first two years, there were many irate taxpayers and legislators. But once the courses were redesigned and materials and equipment acquired, this mood disappeared because funds freed up by laying off faculty were no longer used for expenditures and thus became savings to the state as a whole.

CONCLUDING REMARKS

THE COMMISSIONER SPEAKS ABOUT PLANS FOR THE FUTURE

We can proudly say that Florida has successfully implemented a plan for reducing costs and increasing effectiveness in its institutions of higher education. Not only have we increased our level of effectiveness, but we have provided our students with a system of higher education that is characterized by humanism and accountability. Now that we have met the demands of the late 70's and early 80's, we must move forward and meet the demands posed by the future. We hope that satisfied taxpayers will be willing to spend more on education now. The year 1985 is seeing a bottoming-out of the decrease in enrollments that has taken place over the last ten years. From now until the year 2000, enrollments will be on the rise again (15). We must take advantage of this temporary lull to prepare for the 1990's. We should invest our money in the resources needed to develop a truly individualized program of instruction for every student--one that is tailor made to fit each student's wants and goals. In turn, we should be able to develop a dollar saving plan for the end of the century that only provides for cost reductions in areas that affect learning outcomes the least. Perhaps we could use a system similar to the PERC (Program Effectiveness and Related Costs) method that was developed by Empire State College in New York (16). It functions as a way of improving both student outcomes and institutional decision making at the same time. By focusing on the master question of the PERC framework (16, p. 75)--What kinds of students working with what kinds of faculty in what kinds of learning programs change in what ways at what costs--we can make cost and effectiveness decisions that should help us achieve a more humanistic and accountable educational system in the future.

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Chapter 5

FLORIDA'S EXPERIENCE WITH EMERGING TECHNOLOGIES IN HIGHER EDUCATION

EUROPEAN ECONOMIC COUNCIL REPORT #529-4827-4211

A SCENARIO -- 1990

by

Dee Andrews

Introduction

This report will focus upon the problems that Institutions of Higher Education (IHE) are facing in the European Economic Council (EEC) at the present time. It will endeavor to outline the similarities between the EEC situation now and that of Florida in 1977. It will also examine Florida's attempt at solutions and how its experience might aid the EEC.

As the reader may know, the IHE in Western Europe have been hindered by a static budget and rising costs for a number of years. The problem is compounded when we realize that almost 90% of EEC students receive some financial aid. In a majority of cases the students receive full assistance. Very few students can afford to personally pay for their entire higher education.

The above situation makes it difficult to comply with the EEC Commission of Education's recommendation of 1981 that more Western European citizens be given the opportunity to experience and complete a higher education. It has long been realized that the welfare of the entire community of a civilized country is related to the number and quality of its college graduates (1).*

The EEC's problem of increasing student enrollment while holding a steady budget and with rapidly increasing costs is quite similar to the educational situation as it existed in the United States in the 1970's. While quite a few states worried about this problem, one state in particular, Florida, endeavored to do something about it. This report, then, is presented with the hope in mind that Florida's experience with reducing costs will aid the Common Market as it looks at possible solutions to the financial problems which it faces.

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

Florida's experiment in cost reduction, especially with "emerging" Technologies", is enlightening. (Emerging technologies are defined as those technological applications that are in the planning or prototype stage when their possible use is first considered.) The Florida experience will be chronicled within the body of this report. The reader should keep in mind that even though improvements in Florida's plan were required, the mere idea of using emerging technologies in a large scale attempt at educational cost reduction was a notable venture. By reviewing Florida's experience with emerging technologies, readers may gain some valuable insights into the nature of educational change.

Florida's Higher Education Problem (1977)

In 1977 the Institutions of Higher Education (IHE) in Florida faced some serious fiscal challenges. These challenges stretched across the entire educational system in Florida but were perhaps more pronounced in the IHE because of the nature of the institutions. The assumption was made by Florida's educators that if the taxpaying public were presented with a choice between fully funding basic education (K-12) or higher education the decision would almost always go with the former. For this reason, special emphasis was given to solving the IHE's financial problems.

The Florida Department of Education projected that for the educational quality of Florida's IHE to be maintained at the same levels in 1985 as they were in 1975, it would take about 26% more of Florida's general revenue funds (2). This would mean that 86% of Florida's revenues would have to be spent on education in 1985. It did not take much thought to realize that the taxpayers and competition from other state agencies would not allow this to happen.

With the avenue of increased funding only a remote possibility, Florida's IHE were faced with the prospects of operating on the same budget yearly but with greatly increased costs. It was felt that students' education would almost certainly suffer. Basic questions about the goals of higher education were asked and solutions to this fiscal problem were sought.

One of the solution possibilities centered around increasing student tuition significantly. This was, however, not seen to be a viable solution because most of the students found they were paying about as much as they could afford for their college educations as it was. The majority of state supported IHE students still required a large amount of governmental funding. (The Florida Department of Education projected that even with frequent increases, student tuition would still only cover 31% of IHE expenses in 1985--a rise of only 7% from 1975 (2).)

Florida's educators also considered our own European idea of drastically reducing the number of students who receive large amounts of state support. Under this plan only the "best" students would have reduced tuition. Everyone else would have to fully support themselves.

Obviously, most students would not be able to do this and would have to drop out of school.

This plan was rejected almost immediately. It flew in the face of the American concept that the state should give everyone at least a "chance" for a higher education (1). It was decided long ago that the government should not discriminate against one citizen or another because of innate intellectual ability, or lack of it, when it came to providing access to education for its citizens.

Europeans have never particularly liked the idea of elitism, either, but the funds that we have had available for the support of education have usually been less than those available in the U.S. In 1977 Florida's educators could see that the "abundant" financial support of the past was quickly being eroded. They realized that some answer other than "intellectual discrimination" or elitism would have to be found.

Florida's Experience

There are a variety of ways to reduce cost in IHEs. A partial list would include the following:

- Increase management efficiency
- Decrease cost of maintenance
- Reduce the number of free services provided by the university to the public sector
- Cease new building construction
- Increase volume of externally generated funds (grants and contracts)
- Increase student tuition
- Decrease the size and number of expensive graduate programs
- Decrease salaries of staff and faculty
- Decrease number of faculty and staff by increasing the student-teacher ratio.

All of the above ideas and many more were given at least some thought and in most cases a partial trial in the IHE. They met with varying amounts of success in Florida and some have been continued while others have been dropped. This paper will focus on the last two possibilities for cost reduction because it was believed that the largest savings could be achieved in those categories.

The last possibility, that of increasing student-teacher ratios, was given a great deal of consideration. The reason for this consideration becomes very clear when we realize that the average IHE faculty member was earning approximately $19,000 per year in the late '70's (3, 4).

When all of the faculty members' salaries were multiplied by the number of teachers in the system (8,600) it was found that about 50% of the $360 million spent annually went towards direct instructional costs (5). Many suggestions came forth concerning the reduction of this sum. Most of the suggestions came down to this central point--if the number of faculty could be significantly reduced a large amount of money could be saved.

One idea for reducing faculty while maintaining the same or a higher number of students was to use instructional media to allow a higher student-teacher ratio to be established. Earlier research studies had shown that students could learn as effectively from instructional media of various sorts as they could from traditional classroom instruction (6, 11). The more common types of media were used in Florida, such as instructional TV, programmed instruction, films, videotapes, and computers. Besides these more traditional media applications, however, some new "emerging" types were also tried. Let's look, now, at five of these emerging technologies. (The reader should remember that although these media are in wide use today they were still in the prototype stage in 1977.)

Emerging Technological Applications in 1977

Videodiscs. Of all the emerging technologies tried this one proved to be the most cost-efficient and popular. Videodiscs are record-like pieces of a special plastic that have 54,000 "tracks" on them. Instead of being played with a needle, as the old time stereo systems were, the videodisc is played with a special beam of light that can be concentrated on one of the special tracks at a time (7). The videodiscs have the ability to store motion pictures, slides, pages of printed material and other special effects. The entire *Encyclopedia Britannica* can be placed on one videodisc. Each disc has high color quality and good stereo reproduction.

The potential of the videodisc was anticipated from its inception. For example, in 1977 a writer in the *Chronicle of Higher Education* stated:

> Videodiscs could have a profound effect on the structure, as well as the methods, of education, especially in continuing education programs for working adults. Videodiscs could fulfill educational expectations raised but never achieved by TV, their chief advantage being that the viewer can choose his own time to watch each lesson in a course. . .slow motion and stop action is another very useful feature (8, p. 5).

One of the major reasons that the videodisc was looked on with so much interest in the '70's was its low cost, even at its first introduction. A disc itself could be purchased for about $10 and the videodisc player (about the size of 1977 portable TV) cost about $400. These prices were very inexpensive when compared with the other "heavy" and "emerging" technologies of the day.

The players could be rented from the IHE but most students found it much easier to simply buy one at the beginning of their college careers (if they didn't own one already). There were, of course, a large number of these players at viewing points (usually in libraries) at each campus. The students still purchased books for some classes but in most cases the videodiscs were found to be more functional. Students found that using the videodiscs enabled them to finish a course's material in as little as four weeks.

The material that could be put on one videodisc varied greatly. One disc might go from an opening film presentation, to a slide presentation, to a group of readings, to role playing. The possibilities seemed to be limitless.

The videodisc also proved to be very useful in allowing students to use the library. Since 54,000 pages could be stored on one disc it allowed the student to check out an entire collection of books or articles. For example, all of the articles in the Journal of Experimental Behavior since its first printing, or all of the works of Tolstoy, could easily be stored on one disc.

Two-Way Cable TV. The one major instructional limitation of the videodisc seemed to be the fact that no prescriptive interaction between the student and a source of feedback was possible. Although tests could be built into the videodisc program, the student often did not understand why an answer was right or wrong and it was difficult for the videodisc to tell the student where to go for more help. This problem of prescriptive aid was solved through the use of two-way cable TV.

By 1985, 66% of the homes in the U.S. had two-way cable TV (7). This type of cable vision differed from the earlier types in that the subscriber could interact with another party instead of just receiving a message. Obviously, this type of technological application had a number of uses, only one of which was educational. Many families acquired access to this two-way cable because of the many functions available. The video phone was of course the most common use of this two-way communication linkage.

In the late '70's there emerged two types of interactive two-way cable TV. The Space Division Multiplex hooked into a telephone network and connected each subscriber to a number of channels that was equal to the number of names in the telephone directory. (This is how our videophones operate.) Students who lived a long way from a campus could make use of this version when they required direct help from a professor. The advantage of this type of communication over the old fashioned telephone was that the instructor and student could look at various examples of each other's work, the professors could exhibit pictures, graphs, and real objects.

Space Division Multiplex (SDM) was not the main medium of instruction when two-way cable TV was being used. Its cost, $25 per call per subscriber (13), made it too expensive for many students. As mentioned above, it was only used for special remedial help. The method used when actual instructional packages were presented to the students was called the Processed Message System (PMS). Whereas the SDM used a regional satellite as a means of transmission (hence its high cost) the PMS used a telephone, television, time-shared computer system. Each student's television was hooked into a computer by a telephone line which allowed for interactive feedback. If, for instance, instruction for a course was in a programmed instruction mode, the computer could diagnose and branch the student to learning material based upon how well or how poorly s/he was performing. The videodisc did not have this capability.

An advantage that this type of instructional TV had was that the student could request the computer to play it for her/him at any time of the day. This allowed the student to watch a module a number of times instead of only once, which is the case with many ITV programs.

The cost of using cable television (CATV) proved to be prohibitive for many classes. Costs made it such that CATV could only be cost effective, as compared to a live teacher, at audiences of 10,000 or more (7). This meant that only about ½ of the lower division classes could afford to use CATV.

On-line libraries. A technological application that held great promise in the late '70's, and is still being used with some success today, was the "Electronic Library". This application was a modification of the two-way cable TV that allowed a user to access the statewide university library. By the late '70's two such information banks were actually in existence (9). As we know now, an entire library can be coded into a computer in such a way that students can search through an index, find the wanted book or article and read it all on the same terminal screen. They never have to move.

It was hoped that a great deal of money could be saved using this process through reduction in library staff, reduction in theft and losses of the materials and through elimination of duplication at each University through the use of a central library. The cost of coding all of the card catalogs, indexes, books and journals into the computer proved to be prohibitive. Perhaps when the Library of Congress completes its current coding project, use of the electronic library will become feasible in Florida.

Microcomputers. Large computers had been in use in education for at least fifteen years when Florida considered its "plan". They were certainly not new. The computers that had been used were usually large in both size and price. As the miniaturization of computer hardware progressed, the Florida educators could see that microcomputers would soon be available on a large scale.

The distinguishing characterisitc or component of a microcomputer is the microprocessor, one or more large scale integration chips that perform the basic functions of a processing unit. By 1977 there were microcomputers on the market that included a 9-inch TV screen, built-in audio cassette unit, full keyboard and numeric keypad for $400 (9). As more memory (32K) was added the cost ranged upwards towards $3,000.

Dynabook. This was a technological application developed by Xerox Corporation in the early '80's (9). It was a device that was intended for use in English composition classes and for uses with term papers in all classes. It contained the following capabilities which were managed by a microcomputer.

- Displayed printed pages of text
- Every illustration, even pages of text, could be shown in multiple colors
- Any style or typeface could be used
- Any size type print could be used
- The student or teacher, through use of the keyboard, could edit the text
- Illustrations could be made to move.

Reasons for the Overall Failure of the Florida Plan

The "emerging" technologies described above did not succeed in obtaining the goal set for them: reducing Florida's IHE costs. In fact, none of the instructional media that were used in Florida did much to reduce costs. In most cases Florida's educators realized at a time early in the implementation of the Florida plan that many of the technological applications would actually add more to Florida's IHE bill than they would save. Consequently, use of much of the newly acquired media was discontinued.

Why did these applications fail to achieve the cost reduction goal? It was not because the hardware was technologically unfeasible. All of these media are in use today in varying forms. Their basic form has been improved upon since their presentation in the Florida plan which would indicate that they were viable educational tools.

The basic cause of the Florida plan's failure seems to lie in two related areas. First, there was a dearth of courseware that could be used with the "emerging" hardware. This same problem has plagued instructional technology since its inception and it proved to be the cause of underutilization of much of the hardware in the Florida plan. This lack of appropriate courseware (instruction) is akin to a novelist trying to write with a beautiful new pen but with no plot in mind for his novel. The pen is the tool that the novelist uses to convey his message to the reader. If a plot does not exist, however, the novelist's goal of entertaining the reader will never be met. So, too, must professors have more than just beautiful new hardware. They must also have some well organized instruction to use with the hardware or the goal of giving the student quality instruction will never be met.

The second cause of failure was the lack of funds allotted to develop the courseware. The designers in Florida could see before the plan was developed that a large amount of money was going to be required to purchase and develop the hardware systems. They received, from the state, as much money as they required for this phase of the plan. They failed to consider the courseware problem until it was too late, however, and they had already spent the bulk of their funds to purchase the hardware.

In order to see why these two areas are so crucial to the success or failure of a major instructional media implementation plan let us look at a smaller scale plan that was tried in the 1960's. It is significant that this experience took place within the Florida IHE system also. The fact that it proved, in large measure, to be a failure suggests something about the failure of educators in general to learn from their past mistakes. The following example will illustrate this point.

A Brief History of Florida Atlantic University

On May 10, 1960, a planning commission was established by the State Board of Education for ultimate establishment of a University at Boca Raton, Florida. The commission seems to have been very progressive in its outlook on Higher Education. After considering the purpose and goals of Florida Atlantic (the university was meant to be for upper division and graduate students only), the commission made twenty-six recommendations. Some of the most progressive and, for 1960, innovative ones, appear below (10).

- Major emphasis should be placed on securing a faculty of outstanding competence, the use of some of the newer techniques whereby faculty resources can be used more effectively, the organization of an educational program that will concentrate on essential elements, and the delegation of a large responsibility to the students for their education.

- Every effort should be made to minimize the lock step, time serving characteristics of conventional programs.

- Independent study and comprehensive examinations should be used to allow the student to progress at his own rate.

- Much of the group instruction should be done by television.
- Much of the instruction, both lecture and discussion, should be planned and conducted by teaching teams.
- A system of evaluation of entering students should be established to determine the students' competencies and educational status within the university. These evaluations should be administered during an extended orientation period.
- A Learning Resources Center should be established. The LRC should be central to the university's program and should include the library, television studio and transmission facility, audiovisual viewing and listening rooms, a testing and guidance clinic, a reading clinic, teaching machines, language laboratories and other aids to learning.
- The planning of student programs, the aiding of students in making career choices, and much of the routine counseling should be done by machines.
- The permanent teaching staff should be limited in number to those who will be adaptable to new approaches and sympathetic with the basic philosophy of the program (individualized instruction).
- The primary criterion for recognition of merit should not be research productivity, as is so common in higher education.
- The president and chief administrative officers must be wholeheartedly in sympathy with the philosophy and character of the program that has been developed.

These recommendations and others all pointed towards real educational change. The commission could see that new teaching methods making use of educational technology, might not only increase student learning but might ultimately cost less due to a smaller faculty.

Dawson (10) reviewed the progress of Florida Atlantic in 1974. It is very illuminating to examine the conclusions of his study. Of the twenty-six recommendations made by the planning commission, eight had been partially implemented and only one had been fully implemented.

Dawson identified seven critical incidents that he felt led to this poor translation of the original plan into working reality at Florida Atlantic University.

- The faculty that were recruited to build the institution came from traditional backgrounds and maintained their traditional orientation after arrival at FAU.
- The new and developing State University System placed limita-

tions on FAU that resulted in the abandonment of innovation and a move toward conventionalism.

- The funding formulas forced on FAU included a 40 percent higher productivity rate than other member institutions in the system.
- The students who did enroll in FAU were occupationally and professionally oriented. They were conventional in both their needs as well as their expectations of the university.
- The top-level administration did not perceive the recommendations of the planning commission to be a blueprint from which to build the institution. The administration felt that it was at liberty to alter the plan however it seemed appropriate.
- The organizational structure was changed from the original plan during the early months and years of the institution's development.
- The faculty was forced to attempt innovation at its own expense. It was not allowed released time to prepare for the innovative curriculum the planning commission expected.

Details of the Florida Plan

It is interesting, now in 1990, to wonder if any of the educators who participated in the structuring of the 1977 Florida plan attempted to review the Florida Atlantic experience. It is doubtful. Many of the mistakes that were made with FAU were repeated, in some form, in the most recent Florida plan.

Let us examine how the Florida plan worked. Special emphasis will be given to the use it made of "emerging technologies". As we proceed through this discussion, the reader is asked to remember some of the problems that FAU had and note the similarities.

As mentioned earlier, the Florida plan did not achieve the degree of success that was hoped for it because of two main factors: lack of funds and lack of courseware. The main goal of the program was to reduce the number of teachers that were used in the IHE. The reasoning was that if a large number of faculty members could be replaced by well planned mediated instruction, a great amount of money could be saved.

The originators of the plan could see that a huge sum of money would be required. As mentioned earlier, IHE professors, with their relatively large salaries, were looked upon as the main source for these developmental costs. It was felt that reducing the faculty would allow funds to be released every year that otherwise would have gone to pay for faculty salaries.

For example, if one third of the faculty members could be released (approximately 3,000) the savings would have been about $57,000,000 per year. Although a large sum would have had to be spent on buying the original media equipment, the cost for maintaining it would have been a fraction of the original cost. Faculty salaries, on the other hand, would have kept growing larger each year in order to keep up with the cost of living and for raises.

This cost reduction plan turned out to be disastrous because the faculty unions fought it from the beginning. The Board of Regents (BOR) tried to begin the lay-off plan in 1980. It was hoped that through retirement and attrition approximately 500 of the faculty would leave the IHE system by 1985. Naturally, they would not be replaced. In order to release the remaining 2,500 faculty members the administrative boards devised a plan whereby those teachers with the most seniority would be kept and the remainder would be let go. About 500 a year would be laid off until the desired number was reached.

As can be imagined the faculty unions were irate. They sought and won a court injunction to stall the layoff. They then brought litigation to halt it altogether on the grounds that financial exigency had not been proven. The courts ruled that this method of lay-off was an unfair labor practice and conflicted with the agreements reached between the unions and the BOR which, in effect, said that no layoffs could occur unless the funds to pay the faculty were simply not there. It was ruled that if the money was to be invested in hardware then it could just as well be paid to the faculty.

The BOR reassessed its position and came up with a plan that would allow it to lay off the faculty by units. That is, an entire department or a section of a department could be released if it was proven that a lack of student enrollment did not warrant its existence.

Once again, the courts ruled that this could be done only if it could be proven beyond a reasonable doubt that, at least, some students did not want or desire the courses in the department. The BOR could prove this in very few instances and consequently only about 100 faculty members could be released. The courts followed a line of logic that said if the money saved by mass layoffs would be plowed back into new media then there was really no financial requirement for the layoffs.

The BOR soon realized that their original plan of laying off faculty members in order to free up funds was doomed to failure. The faculty union proved to be too strong. One idea that was given some consideration for the releasing of faculty members was to close some of the 37 universities and junior colleges in Florida. Political forces within the state immediately ruled out this possibility.

The BOR was determined to carry out its plan of mediating and individualizing instruction. They decided that if this form of instruction could be implemented for a few years the legislature might see that money could be saved. It then might pass new laws which would allow the faculty size to be reduced. Since the BOR could not get the money by releasing faculty, they decided to ask the legislature for a one time developmental grant. The legislature, by this time (1982), had become extremely alarmed by the growing education budget.

After being assured by the BOR that this reliance on "emerging" and other technologies was the course that would ultimately lead to lower IHE costs, the legislature approved a one time development grant of $15,000,000. This figure was not as much as the BOR asked for but they felt that if the first Florida plan was a success more funds would be forthcoming.

With the developmental money in hand, the Florida plan administrators set about buying the "emerging" technological applications, previously described, in varying amounts. Once the equipment was purchased, the implementers came face to face with a problem to which they had theretofore given little thought. What instruction would they use with their newly purchased hardware? The realization began to emerge within the planners' minds that instructional hardware, in any form, is merely a means to an end. The end, of course, is survival in and contribution to the society. Effective instructional hardware can contribute to this end by facilitating effective learning in school.

A large portion of the legislature's special grant had been used to purchase the hardware and very little was left over to design and develop the instruction. It was found that it normally takes approximately 50-250 hours of work by instructional designers to develop one hour of high quality mediated instruction (11). When we consider how much it costs to pay professionals for 50 hours, we can begin to realize how expensive it is to develop instructional courseware.

When the Florida plan administrators realized that it would be financially impossible to employ enough professional instructional designers and media personnel to develop the quantity and quality of software required, they then asked the faculty of the IHE to become the designers of the instructional courseware. Some effort was given to this project but it ended, for the most part, in failure because the faculty members were not given a sufficient amount of help in doing the design work; they were too busy teaching students.

The Carnegie Commission in 1972 outlined six major reasons why the design and development of courseware in the IHE does not progress well in most design projects. These same problems continue to plague instructional designers in colleges and universities (12).

- Instructional technology is not uniformly welcomed by the academic community.

- Faculty members who are interested in designing learning materials for the new instructional technology usually are not properly rewarded for their efforts. (Remember Florida Atlantic's experience.)

- There is a lack of compatibility between products of different manufacturers.

- Faculty autonomy works against adoption of other than locally produced materials.

- Faculty members, in general, do not possess the skills required to develop high-quality instructional materials. (This was certainly borne out in Florida.)

- Research, in general, has not shown significant differences between learning from media vs. learning from conventional methods. (This sometimes causes faculty members to wonder if the effort to develop courseware is worth it.)

All of the above problems seemed to exhibit themselves in one form or another during the faculty design phase. A number of instructional designers were hired to work full time with the faculty members but there were far too many teachers and classes for the number of designers available. (We must remember that hardly any of the faculty had been given released time.) Some of the products were quite good but for the most part faculty resistance was too great to create the amount of courseware that was required.

As one might gather from the prior description of the Florida experience, the entire plan turned into a dismal failure. By the time 1985 arrived, the education budget did, in fact, use 86% of the General Revenue Funds just as had been projected. The legislature took drastic steps to reduce the budget. This time a large portion of the IHE faculty were not rehired. Every court case that the faculty unions contested was lost because the BOR could show that the funds truly did not exist to pay the faculty and this time no money was there to be used to develop alternative instruction.

The legislature did not stop with the large faculty cuts. Library budgets were cut to bare operating expenses. Athletic budgets at almost every university in almost every sport were eliminated. Extraneous programs of almost every kind and description were dropped from the IHE.

Student enrollment dropped dramatically as a result of these cuts. Many citizens lost faith in Florida's commitment to higher education and decided to go out of state or to private universities to seek an education. This desire to leave the state also spread to many of the remaining faculty who feared more layoffs would follow.

One might wonder why the legislature had allowed the funding situation to reach a condition where the drastic cuts had to be made all at one time. Why had they not reduced the budget slowly over a period of years? The fact was that some of the legislators believed that the mediated instruction would allow the IHE to begin reducing costs. This, of course, was a fallacy. The "emerging" technologies were merely an add-on cost. They replaced virtually no faculty members and the legislature's special allocation of $15,000,000 of three years before had been dissipated because the money was spent without effective instructional courseware being produced. The result of this was that the legislature was in no mood to listen to the educators' pleas for more money.

It has been stated in this report that the lack of funds and lack of courseware for the development of the Florida plan was the main cause of its failure. There is little doubt but that this was true. Another factor, however, that even the other two factors was the lack of overall commitment to this change program. This was one of the main causes of the disappointing Florida Atlantic University experience. The unions, the legislators, and the public did not truly believe that a budget crisis was coming until it was too late to do anything to avoid the disaster.

The Florida plan had many educational flaws in it but it still would have had a fairly good chance of success had the educational community become committed to it. Instead of solving the problem, however, it merely added to it and caused it to become more convoluted. A solution was chosen before the actual problem had been identified and verified. Blame for the disaster was placed upon various sectors of the education community and the IHE system there is slowly starting to rebuild after five years. Had the educators reviewed the FAU experience and planned to address the underlying problems of "deep change", much of what happened might have been avoided.

Lessons the EEC Could Learn from the Florida Experience

It is frightening to realize how closely our own experience in Europe parallels that of Florida. We too are faced with a rising budget if we wish to maintain our present student outcomes. We also wish to increase the enrollment in our colleges. Is it true that, "You can't expect to save money by using technology"? Let us look at how the Florida disaster might be avoided in Europe as we turn to consider "emerging" technologies.

Planning is a major determinant of success in any large scale educational change endeavor. If the proper amount of funds cannot be acquired to plan the entire project effectively, it might well be an exercise in futility. An element of educational change that goes hand in hand with planning is the fact that any large scale involvement with "emerging" technologies is going to cost a goodly sum at the very beginning although we will expect costs to decrease over time.

There seems to be only two ways to raise the sums required for large scale development. The funding agency, i.e., the legislature, parliament, or foundation can increase the educational budget or some items within the educational system can be deleted or cut back. Both of these options are difficult to accomplish but one or the other or both have to happen in order to acquire the necessary funds so that successful change can occur.

As we in Europe contemplate using "emerging" technologies, we must weigh the benefits against the costs. Comprehensive needs assessments and financial analyses will have to be made. Everyone involved with the IHE will have to realize the change that is being attempted and they should be updated on how it is progressing. People can accept problems much more easily when they have at least some idea that difficulties are coming. (Remember the anger of the Florida legislature when they suddenly found out that the solutions that the administrators of the Florida plan had been promising did not actually work.)

The goal of increased student-teacher ratios required the development of individualized instruction. Briefly, we will review the instructional design steps taken by some faculty members for teaching "large classes". By "large classes" we mean those that had the potential of having very large student-teacher ratios. In order to have the mediated instruction become cost effective the newly developed instructional courseware was used at all of the IHE campuses. Obviously, economy of scale could be achieved only in courses that had very large enrollments. The basic courses in history, math, English, social sciences, physical sciences and other such departments were identified as the courses that were prime candidates for standardization.

It is important to realize that this standardization of courses was not easy to achieve but in order to make the change cost effective it was necessary. Wager (14) considered the idea of course standardization and concluded that:

> Ideally, one might conceive of a system where similar courses, e.g., freshman composition, had similar behaviorally stated competencies that were assessed with objective-referenced tests. This situation might be approximated in some lower-level courses with some state college systems, but in reality it would be difficult to get a large number of institutions to accept the same curriculum or a standard criterion performance (p. 414).

Although acceptance of the same curriculum was achieved for a few programs, it was certainly not the norm in Florida's IHE. Therein lay a major reason for the failure of the courseware.

Below is found the method that was used to design and develop the individualized instruction for one program (mathematics). It proved to be one of the few successful attempts at courseware development. It is presented here to illustrate to the reader one method of design. There were a few other methods that were used for other programs that achieved the intended goal of a unified curriculum. The vast majority of programs, however, never did formulate a coherent, workable method for producing a curriculum that was the same for similar courses on all campuses. Had these efforts at curriculum development been attempted for each course in the IHE, the Florida plan might have succeeded.

A. An expert conducted a needs assessment for each individual program (18). Professors from each IHE assembled according to the large enrollment classes that they were assigned to teach. For example, the professors at the University of Florida who taught math met together. At this time the professors examined the previously mentioned needs assessment outcomes and outlined what they felt should be the skills, knowledge and attitudes that each math student should achieve upon legal exit from the program. (This process was difficult because most of the professors were used to thinking in terms of what material should be presented rather than what each student should be able to do at the end of instruction.) A representative for this group of professors at the university was then selected.

B. All of the representatives for the teachers of the math classes then assembled at a central point within the state. Each of those representatives arrived with a list of pre-prepared objectives in hand. There also was an educational technologist, an instructional designer and an expert in needs assessment present. The needs assessment expert had ready the results of a statewide externally-referenced needs assessment (19) concerning general math skills that were required of college graduates in order for them to function effectively after graduation. (Since most of the classes that underwent this planning process were lower level classes, it was difficult to obtain anything more than general needs statements for an entire discipline.)

An instructional designer then assisted the faculty in reconciling discrepancies between needs and present objectives. All of the objectives were presented and all of the disagreements were ironed out. Although the basic content was found to be the same, it was found that most of the departments had different ideas about what the math program outcomes should be. Consensus was finally reached, however.

Once the final list of outcomes was defined and compiled, the list was then compared to the needs that the state survey had revealed. Often, there was some discrepancy between the two. Another revision process was then begun and the discrepancies were resolved to the satisfaction of the teachers, instructional designer and needs assessment expert.

C. The instructional designer then examined the objectives and suggested various media that might be used to accomplish each objective. He did this mainly to see if any great objections to the media were immediately raised by the teachers.

D. A timetable for design and development was then established and it was stressed to the representatives at the seminar that all of the math teachers would have a chance to review the course design as it progressed.

The seminar took six weeks to complete. The designers who were employed full time to work with the design for each particular course, spent about 1-2 years for the design and development of the courseware. They worked closely with media experts to make sure that the right "mix" of media was used for each set of objectives.

The basic design and development process contained these steps (15):

- Stated objectives and performance standards
- Prepared tests of the objectives
- Analysis of objectives for structure and sequence
- An identification of assumed entering competencies
- Pre-tests and remedial instruction
- Selected media and written prescriptions
- First draft materials
- Small-group tryouts and revisions
- Classroom tryouts and revisions
- Performance evaluation
- Revised instructional materials

The materials were then constantly reviewed, revised and evaluated both with the faculty and the students. Numerous one-on-one evaluations, small group evaluations and field test evaluations were conducted before the materials were tried on a large scale. Then the entire process was repeated using the hardware applications.

The testing was done by computer at Assessment Resource Centers on each campus. Not only could the test be machine scored but the computer could also indicate sources of extra help for those questions which were missed.

Obviously, not all types of tests could be computer administered and scored. English compositions and term papers were two examples. These types of papers had to be graded by the professor who was responsible for the course on each campus. Since much of the teachers' time was freed because they didn't have to be in class each day, much more time could be devoted to the critiquing of papers.

The previous paragraph alluded to the extra help that was given to each student by the professors. Every student still enrolled on a particular campus and went there for special help, testing, to pay fees, etc. Since most of the instruction was done at home via videodiscs, two-way cable TV and mini-computers, the student did not have to be on campus on a continuous basis.

The individualized courses were learner paced and based upon the mastery learning concept. Some students took four weeks to finish the course while others took six months. Moreover, a student could enroll in a course at any time.

While many of the lower division courses in the universities and community colleges could probably have gone to this mediated form of instruction, there were still many courses that were taught in the traditional mode--that is, a live teacher in front of live students in a classroom. These classes for the most part were upper division and graduate classes and usually had a small student-teacher ratio. The nature of these types of classes was such that a large amount of specialized help was required for each student. Some attempts were made to mediate these types of classes. However, since the majority of Florida's students in 1985 were in lower division classes that, for the most part, were mediated there was not a great deal of concern about classes at the upper division level. (In 1985, 270,000 of Florida's IHE students were in the lower division. This represented 71% of the IHE student body (16).)

Conclusion

Florida's experience with emerging technologies in education has not been a successful one. The reason these technologies (videodisc, electronic libraries, two-way cable TV, Dynabook and microcomputers) failed was related more to inadequate planning and implementation than to any inadequacies inherent in the technological devices themselves. All of these technological applications have proven educationally beneficial in other places. The main cause for failure stemmed from interrelated factors: lack of sufficient funds; lack of proper commitment and planning of the courseware (instruction) that was to be used with the new applications.

In the long run the overall goal of reducing the total higher education budget in Florida was not achieved. Huge sums of money were spent on the hardware in the hope that it would eventually replace many of the IHE faculty members. The Florida plan administrators felt that the original dollar outlay would be recovered within a period of a few years and substantial savings would soon result from this process because of the great reduction in faculty salaries. The faculty unions proved to be too strong to allow any great reduction in their ranks.

The Florida plan administrators, despite setbacks with the IHE faculty, plunged ahead with their intention of utilizing the emerging technological applications, many of which were already purchased. The administrators once again brought failure to the plan because they had neglected to plan adquately for courseware development. The faculty members did not have the skills to develop the instruction by themselves and the administrators had not set enough money aside to have it professionally done by instructional designers. The expensive hardware, as a result, went unutilized in many cases.

Florida's experience has been a painful one for her IHE. Much, however, can be learned from it. The same idea that Samuel Johnson expressed about a dog that walked on its hind legs might be applied to Florida's experience: "It was not done well, but you were surprised to find it done at all." Before any country rushes out to hop on the educational technology bandwagon it should endeavor to keep the requirements for educational changes in perspective. Garlichs (17) in 1977 demonstrated that many innovations in instructional technology have come and gone since the Greeks' days but few, except the written record, have had any lasting effects.

Various reasons were stated by Garlichs for the transience of technological applications in education. She mentions lack of availability, inadequate planning, high cost, and suitability of the innovation. To these we might add the slow rate of innovation in both instructional design and hardware technology.

It is important to realize that educational technology, as a design process including "emerging" applications, can aid greatly in raising the standard of education in the IHE. The prerequisite for this type of constructive change is based upon effective planning and a commitment to follow the plan.

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Chapter 6

EDUCATIONAL MALPRACTICE SUIT IN FLORIDA'S HIGHER EDUCATION SYSTEM: A SCENARIO, 1982

by
Roger A. Kaufman

THE HIGHER EDUCATION LEDGER *August 14, 1982*

MALPRACTICE IN HIGHER EDUCATION?

Florida Suit Challenges Educational Goals

TALLAHASSEE, FL.

Florida's Supreme Court concluded hearing testimony today on a case which has astonishing implications for all higher education. At no time since the San Francisco City Schools lawsuit where public school administrators and a teacher were charged with graduating a child from high school who could not get a job due to demonstrated illiteracy has there been a case which could shake the very foundation of higher and public education.

Only five of the court's judges set in testimony today in a case involving C.Z. Zetello and his taxpayer's action against the State of Florida's Department of Education and the University of Central Florida faculty and administration due to the fact that Mr. Zetello's son was graduated in liberal arts from that University and could not get a job, nor could he get any prospective employer to indicate that he might be suitable for hiring in the future. Suing on the basis of an implied contract on the usability and suitability of a seller's product for the purpose intended (life, the suit claimed), the action was asking a return of $21,005.76 in specific damages to recover the time and dollars invested by both father and son, and $370 million for the taxpayers of Florida for punitive damages and to set up an alternative university system for those people who had been "cheated" by previous educational experiences. Testimonies today were heard from two state education professors, a university dean of academic affairs, and a president of a state university in Minnesota. One of the education professors, I.M. Reedy noted that there is a rich and long history of providing growthful experiences for learners in higher education everywhere, that it had spawned great people and not-so-greats since its inception, and that all learners should know that higher education was an opportunity to learn, not a guarantee of success. He cited evidence of test scores and their decline nationwide for the last 23 years, and noted that this decline was a matter of public record, and should have been known by anyone entering higher education. Reedy continued that the system was a proud and struggling one, since it now consisted of professors dedicated to their mission, this dedication being critical since 1977 when it was reported that salaries of professors in Florida had become competitive with Louisiana and Mississippi. Professor C.C. Melaissee of Florida Northern State College reported on work on instructional technology application where media such as television and computer assisted learning had been tried and had been an unsatisfactory resolution to declining revenues and increasing demands on teachers and staff members (1).* As an instructional technologist, Melaissee noted that there had been some work done in Florida on the problems of declining revenues for education and increased demand (1) but there had never been any resolution of this problem since the legislature had not used any of the data to form a consistent program of excellence in education; excellence being defined as learner performance. Melaissee further noted that the technology of learning, instruction and planning has been known and available for some time, at least since the late 1960's (2,3,4) but that it had been difficult to impossible to get something implemented due to history, tradition, and vested interests who ran colleges, and hired administrators. Further, he noted, there has always been an apprehension about planned change (5,6) and that every time there was an operating requirement for "deep change" (7) that discretion had become the better part of valor and that the simple solution was usually selected. Thus, he noted, there was a virtual patchwork quilt of laws, policies and procedures which militated against reasonable planned change in any but the most mundane and trivial areas (8). He concluded that he thought that there was not a conscious effort to short-change learners in colleges and universities, but rather a rich tradition of emphasis upon the processes of education without due regard to the outcomes or the usefulness of the outcomes.

Under sharp questioning from Justice Ford, Melaissee scored the high court for consistently making educational decisions on the basis of equality of input and never on the equality of output. Ford seemed ruffled, and noted that the court could not gamble with the future of learners by tinkering with known formulaes and understandings, especially when noted educators had been spawned and supportive of and by this system. Melaissee simply noted that the court was entitled to that position even in spite of the evidence of growing decline in the usefulness of the experience for most learners.

The last witness testifying before the summer break to allow the justices to attend the American Bar Association meetings in Chicago was President J.S. Groot of St. Paul State University. Groot wove a fascinating story of a school born of desperation and hope, and one which had been given a charter to dare to be different. The justices leaned forward, obviously interested in some insights to the problem facing them. Groot noted that they had been facing increased citizen demand for quality, decreased funding when inflation was factored into the dollar flow, a decrease in the entry skills, knowledges and abilities of freshman (both in community colleges and in the four year and graduate institutions), especially in the areas of spelling and reading, and computational abilities. More for less was the watchword, and their state system had undergone many of the studies and trauma he noted that was evident in Florida, based upon his reading of the literature and the two testimonies given earlier.

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*Numbers in parentheses ( ) refer to references which document reference sources. A list of supporting documents can be found at the end of this chapter.

They had tried "big" technology (television, computers) and they had worked, but had not relieved costs nor been demonstrated to work better than other things (1). The way labor practices were in Minnesota, and given the nature of contracts in existence, he noted that there would have been no feasible way of implementing "big" technology in a costeffective way. "We were locked in by our past emphasis upon labor and processes", he noted grimly, "and we seemed to be locked out of 'soft' technology due to resistance to planning and design. Just too many of our faculty and staff thought they knew what to teach, they only had to have a little help on how to best deliver instruction." Groot noted that their fantasies were admirable, but unsupported by evidence or reality. He added that when he had made that public statement that there were immediate calls for his dismissal, and he said that he bowed to their demands and submitted his resignation. He then said that an astonishing thing happened next. His resignation was publicly rejected by the State Commissioner of Public Instruction, the Director of Higher Education for the State, and the President of the Minnesota Senate! He had first heard of this action on the 11 o'clock news! At that time, this group of two men and a woman decided to form themselves, a citizens' action committee for learners and learning, and thought that it was time to put the emphasis upon results, not upon inputs such as faculty, administrators, appropriations, and myths which die hard. In their public rejection of President Groot's resignation they publicly asked him to head their "Learning Lobby" and declare war on ignorance and waste in higher education. They proposed that St. Paul State be the flagship of excellence and success, and that they cut through red-tape, tradition, and small vested interests to prove that learning success in higher education was possible. Groot added that he was simultaneously flattered and frightened. He said, "I accepted with the expectation that I might not finish the year as anything but a scapegoat for higher education." He charged ahead into intensive planning, not in the wholesale slaughter that most had expected. First, he reviewed the literature in the field, and strangely enough ran into something that was produced in Florida in 1977 (9) which noted that one of the problems in higher education was people selecting solutions before they knew what the problem was... thus good ideas failed for the wrong reasons. He did not want any failures. Needs Assessment based upon what learners had to know and do when they exited from the higher education, not based upon what they were able to do in courses, was intriguing (6, 10) for it gave a new perspective on why things had failed when courses were designed and redesigned on the basis of objectives derived by professional experience, not on the basis of the learners' required abilities in the predicted future world. Thus, many well intentioned professors had rejected new thrusts in education because they were "frills" or "nonsense" and on this basis they might be correct! If the content of the courses were not based upon their usefulness, what were they being based upon? "Design for fit" was a catchword that Groot's staff used, and they thought that higher education could "fit" the learners, the educators, and the society. The fit was to be by design and intention, not by happenstance. Groot put together a small planning team, and he and they were trained in "soft" technology. They got hands-on training in various types of needs assessment and system and systems planning models. He noted that it was difficult, at first, for just about everyone on the team (including himself) thought that they were knowledgeable, educated, and that what was being taught was "old wine in new bottles." He added, "We were frankly threatened by something new, something which might make us put aside our treasured biases, stereotypes, and ways of doing things, and we had to look at this 'soft technology' as a tool for us, not 'against' us. Our egos were bruised, but then we thought of the purpose, and we buckled down, got to work, and we learned." Part of what they learned was that there was a difference and interrelationship between inputs, processes, outputs and outcomes. "All of us," he noted, "had been preoccupied by the outputs and the processes, and we assumed that the outcomes, the results outside of our university halls, had to be useful. We did a study to see, and we were partially right, and partially in error."

"It was mean and nasty for a while," he said, "but we did what had to be done, and knowing that the legislature and the Commissioner were backing us and expecting success, and we were bound to deliver. We moved from in-service training to formal planning, and noting

Peter Drucker's sage advice about 'transferring ownership' of new ideas and change, we moved into the political arena. We requested each dean, each department head, and their choice for the most politically powerful member of their respective faculties to list their requirements for results and outcomes. We noted to them that we wanted specifications of results, or ends, not any how-to-do-its. They grumbled, fussed and then did it. Most of the work came out as inputs and processes, but instead of rejecting it, we rewrote them as objectives and specifications, and sent them back for their approval. Amazingly, we had good agreement.

"We used this basic list as the input for one of our partner groups----the educators. At the same time, we were collecting data concerning the future survival and contribution requirements for college graduates from 5 to 10 years out, including work, interpersonal relationships, and values. This was difficult, but there is some material available from such places as Stanford Research Institute (11). Also at the same time, we gathered learner requirements, and handled them pretty much the same as our faculty inputs.

"We then assembled these data, invited our Dean and faculty in, and we put the requirements in priority order, identified the gaps which occur with our current efforts, and listed programs of change and programs of maintaining the positive aspects of our efforts. We were surprised to see, by the way, how much of our programs was already useful and appropriate.

"So much," he said, "for our adventure into 'soft' technology, and then we were into small and big technology—we were going to do what we had planned. It was nice to select media, methods and professors and resources on the basis of what had to be accomplished, not on the basis of how we had always done it previously. Faculty were open by this time, and we were able to identify changes in curriculum, content and delivery methods."

"One thing we did was to let 'big' technology do that which it did best, and release our professors for that which they did best." An example that he cited was for testing and assessment where they used what is called an "ARC" (Assessment Resource Center) which did evaluation and provided immediate feedback for both learners and professors, and supplied a vehicle for course improvement as well. This was a computer driven activity, and was supported by educational designers and measurement and evaluation experts.

Additionally, they started designing courses to achieve specific behavior outcomes--a type of curriculum of attainments (12). Media were designed to support teachers in classrooms where the content of the course is relatively stable and consistent from year to year, and techniques of successful design and delivery of instruction is now part of the professional development aspect of the program.

"Our outreach programs, off-campus and night, are largely on computers and on television. We find that we can do that cheaper and better." It wasn't all easy or without major pain, Groot noted.

The initial plan for improving the financial situation at St. Paul State College was to reduce services and to not hire when faculty left, but this was found to be unacceptable due to the slow turnover of faculty. It was obvious that more drastic or unusual approaches were required. This was not easy in the era of unionization and strong consumerism.

One help was to stop all new construction of buildings. While there was some money in the budget for a new building for the arts, and one for a multi-purpose auditorium, it was difficult to get the legislature to shift the categories. The "champions" of change got it done. This still was not enough money to help the school through to functional change, but it was a help. It was realized that buildings are potential solutions to problems, and must be designed, built and used to meet learning objectives rather than having to fit instructional methods and procedures to the physical limitations of the structures.

Another thrust was used, although the faculty originally wanted to dismiss it--the integration of curriculum. While there were many specialty areas at the school, each proceeded as if each were independent, and each professor and department taught to their own objectives and left to "brightness of the student" to integrate the parts into a meaningful whole. Based upon the needs assessment and the derived performance objectives, each curriculum area was subjected to analysis. Overall objectives were compared, and areas of common skills, knowledges and attitudes were identified. Then, a committee of faculty and a planning consultant determined areas of overlap, and planned a common core curriculum--one based upon empirical evidence of common content, not one based upon assumptions and "insights." From this integration, some faculty lines were found to be surplus, and were subject to transfer to other institutions in the state system, and this failing, to layoff. The union, of course, objected strenuously, even took it to court, and after much arguing it was ruled that "no person was 'owed' a job" and when it was demonstrated that the quality of the output (learner performance) was not jeopardized or deteriorated, that surplus could be declared. It was not an easy pill for many on the faculty to swallow, but it was greeted well by taxpayers (Ledger, August 1982). This move did save some money, but it was slow in coming. It did, however, result in significant increases in test scores by the learners who moved through this "integrated curriculum" on the statewide and national criterion-referenced testing.

Another savings was achieved in books and learning materials. While most schools used great numbers of textbooks which, according to most professors "did not quite hit the mark in my course" the determination of detailed measurable learning requirements led to the development of "little" media and thus the development of programmed instructional materials, self-paced materials, and the like. While some texts were used, the savings in not using a learning materials fee to the student which more than offset the costs of materials development after the second year.

Finally, the use of professor time was reduced by the use of learning resource centers and materials which were specified by the professors. This allowed for two things to happen. First, each professor could spend more time in individual student interaction and development of learning materials, and second, they were able to effectively interact with more learners. The net result was to allow more students to come to St. Paul State, and the FTE's increased. Thus with more money coming in, and costs of instruction going down, there was a significant increase in cost-efficiency, cost-effectiveness and cost-benefit. This later being indicated by the jobs and activities of graduates when they left St. Paul State.

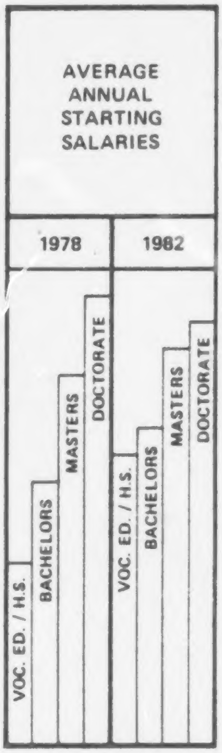
"Changes are still happening to St. Paul State," the President noted in his testimony, "but we have realized several things. First, student morale and performance is higher than anyplace else in the nation. Second, after the initial shock and altercations with the faculty and staff, faculty morale and satisfaction is up considerably. This is heartening, for we thought it might have been damaged beyond repair. We finally found out that most professors want significant learning to take place. They had been steeped in traditional methods with the belief that they were 'best'. Now they know that new ways help them to be more effective, and they are happier than before. That was the toughest part of this whole effort. Finally, we found that we could offer better educational results at a lower per-student rate than before--all we had to do was to 'bite the bullet' and move towards performance as a criterion for change, not classical beliefs and fantasies."

"Was it worth it?" asked Justice Ireland. "Without a doubt," was the instant answer of the grayhaired president. "We could not have done it, however, without the full backing of legislators who cared about learning and performance, and a state department of education that thought about learners and not about jobs and tradition. That was the real key, caring about learning and learners."

"All in all," Groot concluded, "we are doing a measurably better job with less money and in less time." The legislature is so pleased that they are making performance funds available to the rest of the system if they will do a performance-based program renewal as well."

The court adjourned for the American Bar Association Meetings and is scheduled to reconvene on the Zetello case September 28. Those knowledgeable in the field predict that this case will go as the San Francisco case, nowhere. Unions and organizations have let it be known that this case cannot and will not be won by the plaintiff for it threatens the entire system of higher education nationally. ●

-Roger Kaufman



GAP NARROWS BETWEEN SALARIES FOR HIGH SCHOOL AND COLLEGE GRADUATES

Results of the 1982 Annual Census Update indicate that graduates of traditional high school and voational education programs are earning substantially higher starting salaries than their 1978 counterparts, even after standard inflation increases are added to the 1978 salary figures. Yet increases in the average annual starting salary for those holding bachelor's degrees have not kept pace with the inflation rate in the last four years. And with the recently declining standards by which Ph.D. degrees are granted, the average annual starting salary for doctoral graduates has actually decreased since 1978. ●

-Cynthia Hoffman

THE HIGHER EDUCATION LEDGER *October 11, 1982*

HIGHER EDUCATION MALPRACTICE ACTION DECIDED

Court Awards Specific Damages to Zetello

TALLAHASSEE, FL.

After deliberations only interrupted by the American Bar Association Meetings in Chicago,the Florida State Supreme Court, in an unprecedented action found for the plaintiff, C.Z. Zetello, in his case against Florida for graduating his son who then could not get and keep a job. They noted that there is an implied warranty in any set of goods and services, and that the product here was not as advertised under a heretofore little known statute concerning truth in labelling. Instead of awarding the punitive damages to Zetello, they awarded him the requested $21,005.76 and required that the State of Florida use the balance of the judgment to begin a demonstration college, and a demonstration university (one a community college, another a four year institution) to begin a program of competency-based design and delivery within the next year, and to report to them the progress on a semi-annual basis until positive learner results were achieved.

In finding for the plaintiff, the majority of the court noted that there was a demonstrable model (St. Paul State College in Minnesota) of success which showed that results could be achieved, and that this did, in fact, define quality education in terms of results achieved, not effort expended. In a supporting note, Justice Ireland noted that this represented a shift from intention to results, and had great implications for past efforts and activities where the legislature had required faculty to report their physical presence on campus at a minimum of 31 hours per week, and certify their attendance. This shift, Justice Ireland noted, was from paying a cow for standing over a milk bucket to paying them on the basis of the milk given.

In a dissent by Justices Greiver and Forthright, they noted that this was undermining the whole system of education in the United States, and that tradition would not be served by such folly. They noted the progress in the country was by evolution, not revolution, and feared that this type of consumerism was not within the statutes. State Superintendent of Schools J. Shirley Kropp stated that she would immediately move to get enabling legislation and support to accomplish this court-ordered requirement. She also noted that they were in the process of negotiating with Dr. Groot of Sarasota, Florida, recently retired from St. Paul State University, to head up the planning effort if not the total program. Groot was not available for comment.

Zetello and his son were pleased. They noted, "Although we could have used the punitive damage money, we feel that we have made a contribution to the current and future learners of Florida."

The Governor is convening a special meeting of the Florida Senate and House education committees to seek required support activities and legislation.

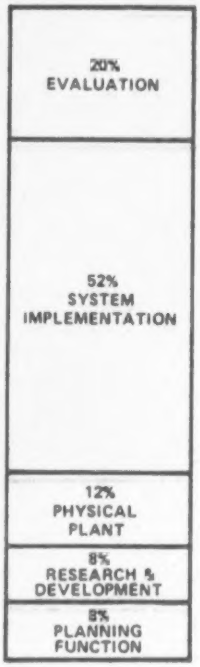
No thought has been given, as of this date, to appeal to the U.S. Supreme Court, we understand from reliable sources. •

-Roger Kaufman

PLANS INITIATED FOR FLORIDA'S DEMONSTRATION UNIVERSITY

Projected budget allocations have been released for Florida's new competency-based demonstration university, which is scheduled for completion in 1983. An innovative approach to priorities in spending is reflected in the funding proportions prescribed for each category. The planning function is expected to receive equal funding priority with research and development. Another unusual feature of this budgeting process is the requirement for the university to justify, each year, the number of degrees granted by the recipients' ability to survive and contribute after they leave. This emphasis upon the school's added value to the graduate's future will bring in a new era of "external" accountability. The budget reflects the importance of the evaluation component of this effort in order to assure such review of how well the graduates do when they leave the university. •

-Cynthia Hoffman



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Chapter 7

INCREASING EFFICIENCY AND EFFECTIVENESS: SOME QUESTIONS TO BE ASKED

by

Pamela Eaddy

> No state of higher education is foreordained; rather a wide spectrum of possibilities, ranging from stagnation to sustained progress in quality, efficiency, and growth is open to us, depending upon the kinds of decisions we make (1, p. 2)*.

Introduction

The scenarios presented in this report are a sample of the alternative futures available to higher education. Perhaps the most important implication for the years ahead to be drawn from the scenarios lies in the realm of method rather than substance. The authors of the report believe their efforts will have been worthwhile if readers are convinced that the best hope for meaningful survival depends upon the development of systematic and responsive long-range plans.

We are capable of doing something much more exciting than predicting the future of higher education; we are capable of actually determining what kind of future we will have. Change will come in higher education as we move toward the year 2000 whether we prepare for it or not. We can choose the role of spectators gazing into the unknown and to a succession of crisis situations as each in turn becomes intolerable. On the other hand we can choose to actively participate by assuming responsibility for changing the course and direction of the future system. We hold the potential through long-range planning and consideration of alternative courses of action for molding the kind of higher education we desire rather than which just evolves.

If we choose to make a commitment to participation and long-range planning, we must be prepared to ask some difficult questions about the functioning of higher education in Florida. Where do we stand today? Where do we want to be in 1987? What alternatives are available for moving us in the desired direction?

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

All participants in the higher education system must be willing to cooperate in long-range planning. All must be willing to examine the validity of their assumptions concerning goals and objectives for the system. The direction of educational change in Florida is dependent upon decisions made by the Governor, the Legislature, voters, the State Board of Education, the Commissioner of Education, the Board of Regents, and the governing boards, and administrative officers of the various institutions. Boundaries of jurisdiction and responsibility blur with the result that a single individual, group, institution or agency acting alone cannot successfully implement changes such as those discussed in the scenarios in this report. The commitment to long-range planning must be accepted by all participants in the system. Expertise, resources, and authority must be focused on a mutually desirable future for higher education and agreement must be reached on the methods and means for reaching that future.

The purpose of this chapter is to consider several of the questions that will arise in any effort to bring about planned educational improvement through long-range planning and consideration of alternative courses of action.

Where Do We Stand Now?

Although new taxes were approved by the 1977 Florida legislature it does not appear that the additional revenue generated will be capable of meeting all of the cost increases forecast for higher education in 1985. Financial prospects for the years ahead do not appear bright. Taxpayers have also felt the impact of inflation in recent years and are beginning to demand that legislators not continue to burden them with support--at higher levels each year--of a system that has great difficulty demonstrating effectiveness or efficiency of operation. The current abundance of Ph.D.'s and the difficulty experienced by many liberal arts graduates in finding jobs are events that recently have reinforced the growing public suspicion that something is wrong in what goes on in the halls of academia.

Research has been published suggesting that academic success in higher education is not related to life success (3, 4, 5, 6). Although many people still place a high premium on the college or university degree and believe it is a good investment in success, a better job, and a more fulfilling life, there is undeniably a new mood in the nation with which higher education must reckon. A mood characterized by loss of confidence in education as a social and economic success formula.

During the 1950's and 1960's higher education experienced a period of unprecedented growth. Sputnik and the associated fears it generated of a technoeducational lag in America greatly increased college enrollments. Escalating demands for many occupations requiring a diploma reinforced the image of college training and social and economic success. The diploma came to be viewed as an instrument of mobility that pushed those who possessed it to higher levels of affluence in the society.

In 1958, the United States Commissioner of Education citing the low number of Ph.D. degrees awarded each year by American institutions asserted:

> If we could only multiply our output of trained manpower at the Ph.D. level by 33 times, just consider what tremendous additional brain power we would have for creative endeavor, for scientific achievement, for research, and for all our scientific and professional fields in which amazing advances are in stow (7, p. 63).

Growth was considered a reliable index of excellence and funds were generally available to expand existing programs or create new programs. Enrollment increased 100% in little over a decade accompanied by larger total operating costs and sharp rises in costs per student (9). A dramatic increase was felt in the impact of higher education costs on the budget of the nation as well as individual states. As the political and economic picture changed over the next decade higher education expenditures began to be more critically analyzed. The purpose of the university and the functions it should serve were becoming cloudy. Writers such as Peter Drucker began to warn of an education crisis ahead:

> Within the next decade education will be changed. It will be changed first, because it is headed into a major economic crisis, is indeed deep in it. It is not that we cannot afford the high costs of education, we cannot afford its low productivity (8, p. 2).

Today it is generally acknowledged that the crisis that Drucker predicted is upon us. Higher education budgets are in an inflationary squeeze. Financing colleges and universities is a nationwide problem of increasing urgency. The university administrator, who in the 1950's and 1960's was concerned with the budgetary consequences of institutional growth, must today grapple with the educational consequences of severe budgetary constraints. Public insistence grows that costs be more closely related to learning outcomes, to the quality of the education provided, and to returns on the invested dollar. Concern that students are leaving college without marketable skills is exacerbated by the current economic situation. How much and what kind of higher education society can afford is the question raised with increasing frequency. Its resolution will require making some hard choices and placing relative values on alternative courses of action.

What Functions of Higher Education Can We Afford to Support?

The word "afford" is slippery. We can, of course, afford those services on which we place high priority. The availability of funds for higher education is dependent upon the health of the economy and the political strength, and the priority placed on other services which also compete for support from public tax revenues. Determining the relative priorities for services such as health care, housing, social welfare, environmental protection, energy, and law enforcement is becoming an increasingly difficult task.

The economic arguments for the priority traditionally placed on higher education seem less valid today than at any time in our history. As a larger percentage of the population has received a college degree, the economic benefits in terms of increased lifetime income has been shown to be decreasing. Christopher Jencks (10) and Raymond Boudon (11) suggest that broader access to higher education will not reduce economic and occupational inequalities, or affect the strong relationship between parental income and occupation and offspring's income and occupation. What happens to higher education when it no longer gives a specific and marked advantage to its consumers? Can a society that has been conditioned to value a college education for its instrumental, social and economic benefits come to value it for other intrinsic reasons? It has been suggested that college should increasingly come to serve the personal development of students. Cultural enrichment and improvement of the quality of nonworking life could replace economic benefit as a major goal in the years ahead. If such an approach is taken much of the current curriculum in colleges and universities may require revision. Bayer, Royer, and Webb, in a study of 252 colleges and universities across the United States, found that 70 percent of the seniors felt that "much of what is taught at college is irrelevant to what is going on in the outside world" (12, p. 27).

What functions of higher education can we afford to support in 1985? Should we retain the traditional functions and attempt to deliver them at reduced costs to the taxpayer--that is should we strive to become more efficient? Or, should we reevaluate goals and objectives in an effort to make sure they are still relevant to current social, cultural and economic problems--that is should we strive to become more effective? The witness of this report believes that when education can no longer benefit its consumers, that is when it lacks effectiveness. It cannot be afforded regardless of how economically it can be delivered. Peter Drucker makes the point well when he states:

> . . . even the most efficient business cannot survive, let alone succeed, if it is efficient in doing the wrong things, that is, if it lacks effectiveness. No amount of efficiency would have enabled the manufacturer of buggy whips to survive (13, p. 45).

Do We Really Want The Same Outputs in Higher Education Delivered at a Lower Cost?

The Florida Department of Education has forecast that community college enrollments will increase 38 percent by 1980 and 73 percent by 1975. The State University System is expected to be serving 41 percent more students in 1975 than at the present time (14).

At the same time Florida enrollments and educational expenditures are expected to increase without commensurate increases in state revenues, trends are being noted at the national level which also will have an impact on the future of our higher education system. A recent effort by 26 leaders in higher education to consider future directions for higher education resulted in the following projections (15):

- A higher proportion of adults attending colleges and universities.
- A higher average age of the beginning higher education student and an increase in the number of students who interrupt their schooling for work, travel, or other personal interests.
- Use of institutions of higher education to provide training for those whose occupations have become obsolete, and for new jobs created by technology.
- Growth in off-campus locations for higher education.
- Development of new approaches to determining standards and measuring outcomes in higher education.
- Extension of higher education to individuals formerly limited in their ability to participate due to factors such as income, race or sex.
- Increased governmental intervention in college and university management.
- Increased demands for accountability.
- Emphasis upon a consideration of cultural and racial diversity in designing and providing education experiences.

What will be the consequences of forecasts and trends such as those listed above for higher education in Florida? Enrollments and costs will rise at the same time expanded services, relevance, and accountability are demanded. A common response to such situations in other states has been to look for ways of improving the operating efficiency of higher education institutions. Finding a cheaper way to manage ongoing activities has often been seen as the only road to survival in the years ahead. Cost analysis has become a national pasttime in higher education. Some observers have suggested that educational costs per student could be reduced a quarter or even a half by applying the principles of business management (16)--the question of efficiency, or in the words of Drucker (13, p. 45), "doing things right." Perhaps we have believed that the functions of higher education are mystical or eternal, "whatever we do, we'll do forever" (13, p. 146). Or perhaps we have believed that lowering expenditures will by virtue of poverty assure us that we are doing the right things.

The authors of this report have tried to convey the message that the concepts of efficiency and effectiveness are closely related. Efficiency involves relationship between means and ends and is maximized when an end is achieved to the greatest possible degree with some given means. Means in higher education are usually estimated in terms of labor and capital necessary to operate the system. Ends are more difficult to specify and include changes in students in terms of knowledge, motivation, and values. They also involve functions performed by the college or university such as research and public service.

It is the multiple nature of educational ends that makes estimating efficiency such a difficult task. Output of commodities such as soy beans or automobiles can be measured in terms of standard units (such as bushels or number of cars produced per month), and cost per unit is generally agreed to be an unambiguous measure of efficiency. But unit costs in education are not very good measures of efficiency. Cost per student credit hour conveys no information about relative performance in the various output areas. Any variation in cost "may result in a qualitatively different total output" (16, p. 3). Cost per student credit hour gives no information about the effectiveness of instruction provided or about other outputs of higher education such as research, scholarship, or public service. Bowen and Douglas have pointed out that:

> Merely because a given educational method results in lowered cost per student, does not prove that it is more efficient unless it is agreed that there has been no qualitative deterioration of output (or at least a less than proportional deterioration). If one could measure efficiency only in terms of cost per student, as many observers seem to imply, there would be no difficulty whatever in improving efficiency. It would always be possible to spend less, and maximum efficiency would be reached at zero expenditures. The efficiency problem is to alter favorably the ratio of two variables, cost and quality. The best of all possible worlds exists when it is possible to cut cost and raise quality at the same time (16, p. 27).

So should the approaching crisis in higher education be considered one of efficiency or effectiveness or both? Should planning and change strategies be restricted to ways and means of reducing costs, or should they also include an examination of the goals and objectives of the system? The writers of this report believe that since efficiency is defined as a relationship between means and ends, it cannot be meaningfully considered until the ends are clearly defined and justified in terms of societal worth. Clearly, higher education cannot be made more efficient until we are satisfied that it is as effective as possible. The first step in improving efficiency must, therefore, be a determination of whether or not we are doing the right things, or in other words, to evaluate the goals and objectives of higher education and to determine their value and usefulness.

Can Higher Education Become More Effective or Efficient Without a Reassessment of Goals?

Peter Drucker (13) has suggested that the first question any organization should ask itself is, "What is our business and what should it be?" Only after this question has been answered should attempts be made to specify objectives and explore alternative methods and means of achieving them. Any organization is built upon assumptions and values which may, in time, outgrow their relevance. The inability or unwillingness to re-examine these fundamental assumptions has often been the most disabling weakness of higher education. Determining goals has always seemed to be a painful process. Palola and Padgett note that some academic institutions engage in "goal evasion" and fail to look carefully at objectives, because once a college or university determines its goals beyond a rhetorical sense, it must be willing to examine the current levels of effectiveness in meeting those goals (17). Writing about the importance of constant goal evaluation, Ziegler has pointed out:

> Educational planning in the United States has largely ignored the need to make qualitative assessments. It has accepted educational goals as given, then translated these goals into quantifiable targets. Even the occasional application of more modern "systems" techniques . . . appear to have provided neither a psychological incentive nor an intellectual tool for generating alternative goals, or for expanding the boundaries of conventional wisdom concerning the future directions education might take (18, p. 14).

One tendency to avoid being held accountable for specific goals and objectives can lead to disastrous results. When higher education is not particularly articulate about what is to be measured, it is fair game for the application of a variety of available measures which may or may not represent what is consciously believed to be the most important dimensions of the system.

There are obvious difficulties in determining the goals of a higher education system or the relative importance of different activities in contributing to those goals. First, the commonly mentioned goals of research, teaching, and public service are usually assumed to complement each other. In reality, however, we may find that each competes with the others in terms of scarce resources and time. Second, the lack of specificity in most statements of goals can have pronounced effects on the politics surrounding educational activities (19). Because precise linkages between means and ends are always debatable, any educational activity is subject to criticism. Lack of a clear conception of desired outcomes can also foster inflated aspirations of what we expect higher education to actually produce.

There are techniques available which seem to have potential for reassessing the goals and objectives in higher education. One of the most promising is needs assessment (2). Using this technique, a "need" is defined as the discrepancy between a present set of outcomes and a desired set of outcomes.

Depending upon the kinds of data used and the assumptions made about which aspects of an educational system are open for change, Kaufman (20) has suggested that needs assessment may be carried out in two ways. One way, called "internal needs assessment" proceeds from the assumption that current policies, procedures, and operating patterns in higher education are basic and unchangeable. It is further assumed that needs and problems should be identified and resolved solely within the confines of the higher education system. In contrast, "external needs assessment" requires input from other significant systems and subsystems in identifying goals and objectives for skills, knowledge, and values that should be provided by higher education.

In the past, higher education has had a tendency to view itself as a relatively autonomous system and, therefore, needs assessment, if conducted at all, has been of the internal variety. As a result, today we find higher education being criticized for not being sensitive enough to the social, political, economic, or human requirements of the society in which it operates and to which it contributes. Public dissatisfaction with higher education, at the present time, may be in part attributed to neglect of involvement of all partners in determining goals, objectives, and directions for change. Higher education interacts with other social, political, and economic systems to such a great extent that in order to be perceived as effective, means must be established to take their input into consideration. It is for this reason that Kaufman (20) has suggested that the assessment of the needs of the total environment of the higher education system, both internal and external, is critical in determining valid goals.

It has been pointed out by Bowen (21) that the process of establishing goals occurs at several levels. First, society must decide what portion of the available revenue should be devoted to the higher education enterprise. Public services such as housing, law enforcement, and health care are also making strong and legitimate demands for funding.

At a second level, goals must be set which will determine how resources are to be allocated among the various institutions, categories of programs, and students in the state. We must, for example, ask ourselves how many law or medical schools are required, how many research oriented institutions? We must deal with the question of whether resources should be spread evenly among all institutions or whether centers of excellence in specific subject areas should be established in various institutions. Should each institution strive for excellence in undergraduate instruction, research, graduate programs, and public service or should such functions be assigned for emphasis only at purposely selected institutions? Should the development of large institutions be encouraged, or should emphasis be placed on the development of smaller branch campuses within commuting distance of large numbers of students?

The third level at which goals must be developed is that of the management of allocated resources by individual institutions in order to achieve maximum effectiveness.

After valid goals and objectives have been established at each of the levels listed above, they must be prioritized. Because only a limited amount of revenue and resources will be available for higher education, low priority goals and objectives must be weeded out. The task of prioritizing goals can be expected to encounter some resistance from groups who see their special interest and programs threatened when some goals are assigned a low priority. As Drucker has pointed out:

> The most difficult and most important decisions in respect to objectives are not what to do. They are, first, what to abandon as no longer worthwhile and, second, what to give priority to and what to concentrate on . . . The decision about what to abandon is by far the most important and the most neglected (22, p. 192).

Validation and prioritization of goals and objectives for the higher education system are only the first steps in a planning process which seeks to achieve increased effectiveness and efficiency. Determining requirements for meeting high priority goals and objectives and identifying and selecting alternative solution strategies should be the next two steps taken (2). Various alternative strategies have been identified in the scenarios in this report. They have included changes ranging from reducing the number of courses offered, increasing average class size, and reducing faculty salaries to individualized instruction, auditorial systems, computer-managed instruction and instructional television.

Given use of a method for establishing valid goals for higher education to pursue, solution strategies such as those discussed in the scenarios in this report can be selected for implementation. Success in implementing, managing, and evaluating selected solutions, will depend in part upon careful consideration of the factors which can facilitate or inhibit change in higher education.

What Factors Inhibit Change in Higher Education?

Implementing innovative solution strategies in higher education has always been a difficult task. New ways of doing things are seldom adopted on the basis of their obvious advantages (23). For example, the teaching function in higher education is being carried out in much the same as it always has.

> Despite a great upsurge of inquiry and research in teaching and learning and much experimentation with novel concepts and new techniques during the decade from 1965 to 1975, genuine and serious innovation is still largely peripheral. It might be the source of profound changes in the next quarter century, but so far it is only catching on (1, p. 2).

Why does change in education seem to be such a glacially slow process? Must achievement be won by taking two steps backward for each three steps forward? What factors inhibit change in higher education? Eric Hoffer speaks of the "ordeal of change" (24). It is an ordeal that all individuals face when adopting a new way of doing something. Most are able to make the transition, but for others the change is too painful to accept. What are some of the factors that should be taken into consideration in order to lessen the ordeal of adopting innovative solution strategies in higher education?

The literature on bringing about change in education contains descriptions of many theories and techniques (25). Role definition, problem solving, linkage systems, power ratios, emulative change, and coercive change are just a few of the concepts encountered. The reader spending much time with the literature is inclined to agree with Howsam who states that "there is much semantic looseness among educators where change is concerned" (26, p. 71).

Sometimes overlooked in the resistance to adoption strategies in higher education is the simple fact that most college and university professors have never been trained to perform tasks such as negotiating student contracts, planning audio tutorial units, writing behavioral objectives, or monitoring individualized instruction. If they are to be expected to implement strategies using such techniques they must be provided with assistance. They must be given early evaluative feedback, as they try new techniques, aid in working out difficulties, adequate support materials, adequate time, appropriate rewards, and administrative support. The incentive structure in higher education has been "closely wedded to research productivity, professional visibility, and effective colleague relations" (27, p. 12). Improvements in efficiency and effectiveness may depend upon our ability to break this pattern and begin to give recognition and reward to professors for the kinds of competencies required by the innovative strategies identified in this report.

It has been suggested that the current resource allocation model for the State University System in Florida could be a factor which discourages the implementation of innovative strategies such as those presented in the scenarios in this report (28). Few resources are made available under the current model for improvement of faculty capabilities and there is no economic incentive to adopt changes that could make higher education more efficient or effective. In fact, the current model may actually work to make significant change impossible. If, for example, the use of para-professional positions or individualized instruction could provide a more efficient use of faculty time, productivity of the system could be increased. However, in subsequent budget allocations, the number of faculty positions and dollars for expense and equipment could fall in a linear fashion so that the use of the strategies could not be maintained (28, p. 6). College and university managers often must be very sure that they spend all the money they have been allocated so that none is taken back at the end of the fiscal period. If an innovative approach reduces dollars spent in one category, there is no assurance the funds saved will be available for use in other areas or to support or improve the ongoing innovation. Increases in productivity are routinely rewarded by budget cuts in the following year. Avoiding reductions of the previous budget level can be a very powerful factor in prohibiting meaningful change in higher education.

Can policies such as the current resource allocation model be changed? A factor which should be considered in attempts to change such policies is the importance of governmental policies and programs and the influence of the political process in shaping the environment of higher education.

Can The Participants Afford To Ignore The Political Process?

In the past, there has been a tendency for participants in higher education to believe they should stand above the political life. Today, however, it is becoming increasingly clear that the important decisions about the future of higher education will be made within the political process. Some observers are very pessimistic about the ability of the academic community to accept this fact and respond appropriately. A former chancellor of the Ohio Board of Regents concluded:

> "As I look ahead at what lies in prospect for higher education planning in the fifty states, I am prepared to stand by two forecasts. One is that the future of higher education policy and decision-making rests upon the political relationship between the higher education community, and the political leadership of a state. This expectation is the lesson of past experience, including my own experience in Ohio, and I know no reason to anticipate a change in the foreseeable future. The second forecast is that the higher education community will remain weak and divisive in its approach to the political power of state government (29, p. 88).

In order to bring about meaningful change in higher education, we must recognize that many of the goals of the system are determined politically. If any group views a potential educational change as a threat to its power or autonomy, it will attempt and often succeed, in stopping the change through the elements in state government most susceptible to political pressure. Directions for change can be influenced by educators but in most instances they are not exclusively determined by them in isolation of the political process.

Frank Bowles has noted that:

> It is not easy to discover how education policy is politically made . . . Sometimes it is made sharply and clearly as part of a general plan for . . . development. Sometimes it is the result of emergency, on-the-spot decisions . . . But, however policy is made, it controls the structure and organization of the educational system and the flow of students through the system. And its effects go beyond the educational establishment to affect the lives of individuals and even the structure of society (30, pp. 2, 11).

Bowles has also noted that when the problems of education are not solved within the system, they are taken up by the public sector where the decision is usually in favor of the majority opinion. Issues formerly settled within the academic community quickly become matters of public policy. "An important axiom in political science is that when one level of government is unable or unwilling to meet the desires and needs of people, assistance is sought from the next higher level of government" (31, p. 6). In other words, when education does not change in the directions desired by the public, the political leaders will change it themselves. In Florida we have only to observe recent legislation such as the Omnibus Education Act of 1973 (Senate Bill No. 622) which established policies in areas such as the number of hours professors must devote to teaching activities, the establishment of teacher education centers, and the grounds on which university professors may be evaluated for the purposes of promotion and tenure. The policies developed will often diverge from decisions of educators because of the multitude of constituencies to which legislators must be responsive.

John Hoeny has suggested that all institutions of higher education should take the following steps to improve the relationships between government and academia:

- Assess the ways in which federal, and state government affect higher education.
- Fix responsibility for purview of governmental affairs in the hands of one institutional officer.
- Let trustees, faculty, staff, students and alumni know on a regular basis what the relevance of governmental actions may be for higher education.
- Know federal and state representatives and what they stand for with regard to higher education.

- Inform government representatives of the accomplishments of higher education and the kinds of problems it is facing.
- Maintain contacts with higher education associations at the federal and state level.
- Inform the public about the accomplishments and problems in higher education so that they may, in turn, influence their legislative representatives.
- Take a close look at how you are organized to handle governmental affairs (32, pp. 90, 91).

Implementation of solution strategies such as those included in the scenarios in this report demand that higher education begin to pay attention to governmental and political affairs. Failure to pursue its interests through the give-and-take of the political process could result in great costs to higher education both in dollars and in policies that inhibit or prevent the achievement of more effective and efficient institutions.

Conclusion

The citizens of Florida have, in the past, made a substantial investment in higher education primarily because they believed it was essential to the welfare and progress of the state. Today many people seem to be losing confidence in the higher education system. They are convinced that unfair burdens for taxpayers, inequalities in opportunities for students, and inefficient and uneconomical practice should no longer be tolerated--they are demanding that the investment in higher education yield maximum returns to individuals and society. This chapter has attempted to present the view that maximum effectiveness and efficiency can only be attained when all partners in the educational enterprise express a willingness to participate in planned change and critically examine their traditional assumptions about purpose, delivery, management, and evaluation of higher education.

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Chapter 8

SOME APPROACHES TO REDUCING THE COSTS OF HIGHER EDUCATION

by

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Introduction

> Quite possibly we may be in the first stage of a long twilight in education--an evening twilight, not a morning twilight--which together with the now familiar diminished public confidence in education, will consist of markedly reduced financial support, fewer students, lessened quality, and curtailed educational opportunities. . .There is clear and present danger that unless we work hard for our mutual cause, unless we interpret in many wise ways to the public what it is we are doing and why it deserves the high priority, unless we plan ahead and have others do so, unless we make the most efficient and economical use of the resources we have, unless we lead instead of simply administering the following out front, we are in for a long period of gradual decline (1, p. 677).*

This statement was made by E. B. Nyquist regarding the educational system in New York. It could have been made in reference to many other states including Florida. What led up to this gloomy forecast? How accurate is it? And if it is an accurate forecast, what can we do to solve the problems that would be brought on by a major financial crisis in Florida higher education?

The purpose of this chapter is to examine some of the assumptions on which Nyquist's bleak forecast is based and to identify and analyze a number of ways which colleges and universities can use to deal with problems of financial exigency, and to draw attention to a vital missing link in our quest for achieving cost-effective higher education for the people of Florida.

Where we are now

In retrospect, the 1950's and 1960's can be viewed as a golden age in American higher education. It was a period of unprecedented growth brought on by a desire to provide higher education to almost anyone who wanted to seek it. The number of Americans who sought a higher education increased dramatically and the taxpayers provided the funds to support this. But then things started to happen. In 1968, Allan Cartter was among the first to forecast the oversupply of PhD graduates that would be produced by graduate schools that had tooled up to provide the human resources for the rapid growth witnessed during the 1950's and 1960's. Unfortunately, growth seems to have limits* and Cartter attempted to forewarn us of that. But the PhD glut was only an early warning. Now we are concerned with an over production of certified teachers. In addition, liberal arts graduates are experiencing increasing difficulty in finding jobs--partly due to a tight labor market and partly due to a lack of employable skills.

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*Numbers in parenthesis ( ) refer to references which document sources of quotations and the validity of projections. A complete list of supporting documents can be found at the end of this chapter.

What do enrollment forecasts tell us about the short run? Cartter and McDowell (10) report that higher education enrollments will level off nationally in 1980 and go into a period of decline with a bottoming out in 1988. This will be followed by a gradual increase to the turn of the century.

Forecasters in Florida see the matter differently. For example, a forecast by the Florida Department of Education (DOE) suggests that community college enrollments are expected to grow 38% by 1980 and to reach an increase of 73% by 1985. Although not quite as spectacular, growth in the State University System is expected to be 41% by 1985 (2). It should be clear that such growth, if it is allowed to occur, will require increased levels of funding. The source of these enrollment increases is attributed to growth in the state's population and program expansion to meet the needs of a new adult clientele.

Higher Education as a Service "Industry": Some Critical Considerations

Many criticisms have been directed toward education and one of the most frequently cited is the inability to operate schools on a "business-like" basis. Callahan drew our attention to this phenomenon in his monograph Education and the Cult of Efficiency (3). A more recent and more penetrating analysis of the problem is offered by Drucker. In a chapter entitled, "Why Service Institutions Do Not Perform," Drucker states that a similar cry is still repeated today. "If only, they all say, their administrators were to behave like businessmen, service institutions would perform (4, p. 137)." He then goes on to say:

> This belief underlies today's management boom in the service institutions. It is the wrong diagnosis, and being business-like is the wrong prescription for the ills of the service institution.

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*Another possible view is that there is not an oversupply of either PhDs or of teachers, but rather we are seeing them only as of use in classical positions and not using them in jobs usually reserved for less-trained people. Looked at in this manner, we are not oversupplying but are over-utilizing many of them. By assigning to "lower" jobs, we can still use their skills, abilities and talents. This is not a frequent or popular view, especially by those who pursued additional education in hopes of finding entry into "higher" levels of jobs.

> The service institution has performance trouble precisely because it is not a business. What businesslike means in a service institution is control of cost. What characterizes a business, however, is control by performance and results. It is effectiveness and not efficiency which the service institution lacks. Effectiveness cannot be obtained by businesslike behavior as the term is understood, that is, by greater efficiency (4, p. 138).

Drucker goes on to point out that the one basic difference between a service institution and a business is the way the service institution is paid. Businesses are paid for satisfying the customer. Moreover, they will continue to be paid only if they continue to provide what the customer is willing to pay for. Customer satisfaction is the basis for assuring performance and results in business. Service institutions, on the other hand, are typically paid out of a budget allocation. This means that they are not paid for what a taxpayer or a customer means by results and performance. In addition, most service institutions, including universities, are endowed with monopolistic powers (4). Intended customers have little choice regarding demands for better service. Taxpayers pay for higher education whether or not they want the services provided by it.

Confusing budget allocation and performance is at the heart of a service organization's problem. According to Drucker:

> Being paid out of a budget allocation changes what is meant by performance, or results. Results in the budget-based institution mean a larger budget. Performance is the ability to maintain or to increase one's budget. Results, as the term is commonly understood, that is, contributions to the market or achievement toward goal and objectives, are, in effect, secondary. The first test of budget-based institution and the first requirement for its survival is to obtain the budget. And the budget is not, by definition, related to contribution but to good intentions (4, p. 142).

Now, applying this analysis to the situation in Florida, we find legislators saying that the operation of higher education is wasteful. Graduates are saying that they have not been prepared to compete effectively for jobs. Taxpayers are saying that it costs too much for what little it produces. Educators, on the other hand, are saying that inflation and budget cuts are eroding the quality of services which can be provided by colleges and universities. However, if what Drucker says about service institutions is true, then higher education in Florida seems to be facing an "effectiveness" crisis rather than a financial one.

Given our perspective as educational technologists, we favor Drucker's analysis of the situation. This is nowhere more evident than in his assertion that:

> Achievement is never possible except against specific, limited, clearly defined targets, in business as well as in a service institution. Only if targets are defined can resources be allocated to their attainment, priorities and deadlines set, and somebody be held accountable for results (4, p. 140).

This statement closely parallels one of the basic principles of educational technology which is that ways and means should be designed to achieve specific results. In light of this, we feel ill at ease proposing strategies and recommendations which are restricted to the question of cost reduction. Something more fundamental is required and that is to address the question of educational effectiveness. Without a thorough assessment of present effectiveness, attempts at cost reduction could turn out to be inconsequential at best, and educationally destructive at worst. If we pursue the cost reduction path in isolation from consideration of educational effectiveness, we run the risk of applying potentially useful solutions but to the wrong problems!

Let's turn now to how effectiveness is interwoven with costs and efficiency.

Effectiveness, Efficiency, and Cost: Threads in the Same Cloth

Effectiveness, efficiency, and cost are inextricably interwoven. This becomes evident when one considers the basic meaning of the concept of cost. In layman's terms, cost is usually equated with dollars spent, e.g., a book "costs" $12.95. Economists are quick to point out that this is an extremely narrow interpretation; there is much more involved than the expenditure of $12.95. For the economist, cost refers to benefits lost (5). In other words, what other things could we have purchased for the $12.95 and what is their value to us? These lost benefits must also be figured into the calculation of "cost." For example, spending $12.95 for a best selling fiction novel could bring a great deal of pleasure to a student but it might be better spent on a textbook in his or her major field. By purchasing the novel, the student "lost" the opportunity to acquire knowledge and skills in a specialty area. Taking the analogy a step further, we lose similar opportunities when we spend our education dollars for programs and services which produce irrelevant or nonproductive learning outcomes. Thus, educational programs cannot be "cost-effective" unless they produce learning outcomes which enable the attainment of valuable contributions for the individual and to society. Now what about efficiency?

Efficiency is an important consideration because it refers to how well we use our resources. Efficiency becomes a key concern once the nature and quality of the product and its price have been determined (6).

The use of average or unit cost (e.g., cost per student, cost per student contact hour, cost per student credit hour, etc.) as a measure of efficiency is widespread in education. For example unit costs were computed and reported for each of the seven major projects reviewed by Jamison et al. (7) to document the "cost-effectiveness" of technological applications such as computer-assisted instruction. However, some writers take a dim view of this practice:

> It seems plausible, but usually incorrect, to interpret currently available unit costs as a measure of efficiency. . . .Unfortunately, costing techniques currently available in higher education cannot establish which programs are efficient and which programs are not (because of low quality, excessively expensive resources, rapid changes in enrollment or other workload, the hidden effects of one-time-only capital expenses. . .or other special circumstances (8, p. 42).

> The mere fact that a given education method (larger classes . . .or computer-assisted instruction. . .) lowers cost per student does not prove that the method is more efficient unless no corresponding loss in quality has been sustained. The efficiency goal is not merely to reduce cost per student, it is to alter favorably the ratio between outcomes (which includes quality) and cost (8, p. 27).

Wallhaus is equally critical of the use of unit costs as measures of either efficiency or productivity. He enumerates several problems that can arise when trying to interpret the meaning of unit costs based on proxy measures such as student credit hours or student contact hours. Acording to Wallhaus, the difficulties involved in interpreting unit costs include (6):

- Student credit hours often do not account for differences in subject matter area, school, level of instruction, or type of instruction
- Differences in quality or skill imparted over time are not reflected in the student credit hour measure
- The use of student credit hours as a proxy measure takes no cognizance of fixed versus variable inputs, or constraints of a technical or policy nature such as economies of scale
- Since cost is the only resource measure involved, there is no possibility (without further analysis) of addressing trade-off possibilities among the resources that underlie cost.

The Change Panel on Academic Economics puts it well when it states:

> After six decades of experience in determining the costs in higher education, we are on the way to knowing the cost of everything and the value of nothing (8, p. 42).

This statement brings us back to where we started--stating that effectiveness, efficiency and costs are inextricably interwoven. The most critical determination regarding an educational program is its worth or effectiveness. For little will be accomplished if we become highly "efficient" in producing irrelevant or useless outcomes. As long as judgments about effectiveness are omitted from decision making, we are likely to continue to reach the conclusion, knowingly or unknowingly, that cheapest is best. Such are the perils of basing judgments on unit costs in isolation from qualitative factors.

Increasing Efficiency

As stated earlier, efficiency becomes a key concern once the nature and quality of the "product" and its "price" have been determined. Efficiency is an important consideration because it refers to how well we use our resources. In the appendix, we present one model for analyzing resource allocations in education. This model deals conceptually with calculation of efficiency by analyzing the impact of different combinations of resource inputs and instructional processes on the production of educational "outputs".

The purpose of this section is to discuss different strategies and procedures that could be used to increase the efficiency of operation of Florida's community colleges and universities. This analysis is based on two assumptions:

- Present ways of providing higher education are less than optimal thus leaving room for significant cost reduction without reducing quality

- Present outcomes of higher education are valuable and make optimal contributions to individuals and society.

The latter assumption is explicitly stated in order to draw our attention to it. Inasmuch as costs and effectiveness are interrelated, if we only examine costs then we either assume that the educational outcomes are at an acceptable level of effectiveness or we are unaware of the possibility that they are less than effective. In either case, the qualitative factor is critical for determining cost-effectiveness. For without an index or an assumption about quality, we are likely to conclude that cheapest is best--a point made earlier in the section on effectiveness, efficiency, and costs.

Identification of Areas with Greatest Potential for Expenditure Reduction

Given the tenuous assumption that present levels of effectiveness are adequate, the first step in selecting alternative cost reduction strategies would be to analyze current expenditure patterns in order to identify categories which have the greatest potential for significant cost reduction. We attempted to do such an analysis in Chapter 1 but were only mildly successful because of a lack of systematically documented data regarding higher education expenditures in Florida. We are unsure of why such data were unavailable. Did we fail to contact the right office which could provide it for us? Or does it simply not exist? The present data were aggregated in such undifferentiated categories that it was not possible to determine dollar amounts or percentages allocated to specific functions such as instruction, research, student services, general administration, plant operation and maintenance, student aid, capital outlay, etc. Therefore, we will rely on estimates published by Bowen and Douglas (9) in order to provide an example.

As can be seen in Table 1, instructional costs are estimated to be 46 percent of the total budget. No single other category accounts for greater than 12 percent of the budget. If we accept the rationale that

Table 1

PERCENTAGE OF HIGHER EDUCATION COSTS BY CATEGORY OF EXPENDITURE*

Category	Percentage
Instruction	46%
Library	5
Student services	7
Admissions	3
General administration	10
Public relations & development	6
Plant operations & maintenance	12
Student aid	11
TOTAL	100%

*Adapted from Bowen & Douglas (9). These percentages were derived from a sample of 12 colleges in 1968. No funds are shown for research because these were four year undergraduate institutions.

the best place to begin cutting back is where the most money is currently being spent, then instruction is the most likely candidate. This is not to say that we should ignore other categories as possible areas for increased efficiency and cost reduction. It should be clear that the potential payoff is greater the larger the expenditure.

As is the case with other service-oriented activities, higher education in Florida may be described as labor intensive. A significant proportion of instructional expenditures goes to pay wages. It is interesting to note that faculty salaries are not affected by either the quantity of output (number of students served) or the quality of output (amount of student learning). What, then, are the measures of performance and how are salaries related to them?

Changing Inputs to Reduce Costs

The problem of reducing costs in higher education is not of recent origin. For example, in 1971 Bowen and Douglas (9) published a book entitled Efficiency in Liberal Education. Although they focused their analysis on the problems of four year liberal arts colleges, many of their suggestions also apply to universities as well. They pointed out that unit costs are an ambiguous measure of efficiency and acknowledge that estimates of efficiency would probably have to be based on relatively subjective judgments about the quality of higher education output. The purpose of their study was much like the one posed for this STAR project: to explore the possibility of improving educational quality while reducing its cost. Following are some of their recommendations.

- Substitute low-cost labor for high-cost labor, e.g., by replacing faculty time with assistant time or by increasing the proportion of junior members in the faculty

This recommendation makes good sense if it is feasible to substitute low-cost for high-cost labor. This is being attempted in elementary schools through the use of paraprofessionals. Teaching assistants are being used in universities with graduate programs. As a matter of fact, it has been common practice to "cannibalize" faculty lines by appointing two or three graduate students per line rather than hiring a permanent faculty member. However, this type of substitution is a bit more problematic at the community college level due to the lack of graduate students. This does not, however, preclude the possibility of hiring part-time instructors who might be available in the community on an as-required basis.

Increasing the number of junior members in the faculty is feasible if there are vacancies to be filled and if one can assume that the "value added" is the same regardless of faculty rank. This will be somewhat problematic over the next 15 to 20 years because of the high proportion of faculty who are presently on the job and will not be retiring until the decade of the 1990's (10). Maintaining a cross section of age and experience will be important so that similar "stagnation" problems will not happen in the future. This may mean filling some vacancies with associate and full professors in order to maintain an effective balance between tenured and nontenured ranks without sacrificing the possibility of vacancies opening up on a regular basis due to "planned" retirements. A department's adaptability and ability to keep pace with changes will depend on its ability to bring in faculty with new ideas. This possibility is reduced if the preponderance of the faculty is at about the same age level and plans to remain in place until retirement.

Another effective means for substituting low-cost labor for high-cost labor has been incorporated into applications of the Keller plan. This is a course design in which content is divided into a sequence of units. A student is not permitted to proceed to the next unit until s/he has mastered the previous one. The rate of learning is individualized with progress being monitored by a learning manager who is usually an undergraduate student who has passed the course with a high grade during a previous term. Each learning manager has responsibility for monitoring a given number of students (e.g., 10-15). In addition to monitoring, the learning manager provides tutoring to students who are having difficulty. The learning managers are supervised by a faculty member who is also responsible for organizing the content and lecturing when it is required. In this way, large groups of undergraduate students can receive personalized, individualized instruction at a low cost because the learning managers are usually "paid" in terms of credit hours. What this means is that the learning manager enrolls for course credit under a supervised teaching experience course number and pays tuition for the opportunity to teach. Granting course credit for this "teaching" experience is justified on the grounds that a great deal is learned about the subject and about teaching when one is required to teach someone else.

- Increase intensity of labor usage, e.g., by raising teaching loads for faculty

Some legislators have argued that as much as $35 million dollars could be saved if all faculty in the SUS were required to carry a 15 hour teaching load. Although it is true that fewer faculty positions would be required if teaching loads were increased, it would be accomplished at the risk of shifting faculty effort from research and service activities to that of teaching. It would have its greatest impact on the graduate research mission of the university and would tend to drive away outstanding scholars who have a national reputation and the mobility to find jobs elsewhere. On the other hand, the research and teaching missions could be made more effective by designating some of the SUS institutions as graduate research universities and to designate the remainder as teaching and service institutions thus allowing a division of labor rather than spreading all three missions across all nine institutions.

Increasing teaching loads for faculty does not appear to be a feasible option at the community college level inasmuch as most are already required to teach from 15 to 18 hours per term. However, increasing class size would be a possible means for raising productivity.

- Substitute student initiative for faculty supervision, e.g., by making study more independent

This tactic could be utilized to permit students to acquire knowledge and skills in academic areas where there are low enrollments. Professors would still be required to carry class-based teaching loads. Self-directed learning contracts, as advocated by Malcolm Knowles, would be a systematic means for encouraging and controlling this option (11). Learning contracts would have the added benefit of enabling students to acquire the skills necessary to become effective life long learners in that their ability to initiate self-directed study would be increased.

- Substitute capital for labor, e.g., by using the library or television in place of lectures

This solution would incorporate applications of instructional media. There is a great deal of evidence that students learn as well from instructional media as they do from traditional instruction (12). However, there is little evidence that the use of instructional media can readily reduce costs. Several conditions must be met in order to achieve cost reduction. One of the foremost is that the scale of operation must be large enough to justify the increased expenditures for required hardware and software. A second condition is that these media-based instructional delivery systems must be used from 10 - 15 years in order to prorate the high start-up costs to achieve true cost savings (13). In contrast to this, Stanford University has attempted to program some courses that lend themselves to computer-assisted instruction in areas of low student demand, e.g., ancient church languages. Although programming costs are initially high, it is argued that this is cheaper in the long run than to retain a professor to teach such a course when it is required by students. This approach would be suitable in areas where the content was stable and did not change rapidly. If it did, then additional expenditures would be required to reprogram and up-date instructional materials which in themselves are high cost activities.

Schramm, in a book entitled Big Media, Little Media, argues that little media such as slide projectors, film strip projectors and audiotape recorders have a greater potential for increasing cost-effectiveness because they are less complicated and less costly to operate. In addition, they could enable a single instructor to teach a larger number of students more effectively (14). Readers interested in learning more about cost reduction through applications of "big media" and "little media" are encouraged to read Chapter 3 and Chapter 4 of this report.

Although Bowen and Douglas did not pursue the use of computer-managed instruction (CMI) as a cost reduction device, there is evidence that it may be the most cost-effective use of the computer in an instructional setting (12).

There is a great deal of research and development work being done on CMI at Florida State University. In this application, students go to an Assessment Resource Center (ARC) to take tests for the courses they are enrolled in. When completed, a student's test responses are scored by the computer which also provides immediate feedback. If performance is below standard, instructions are given as to what must be studied or reviewed in order to remove the observed learning deficiency. Once the student has followed the required learning prescription, s/he may then return to the ARC to take the test on that content over again. This places more responsibility on the learner to acquire course objectives and more responsibility on the instructor to design and develop learning materials, test items, and prescriptions. Given the availability of a computer, the cost of acquiring the terminal hardware is relatively small as is the personnel cost which can be done by student proctors paid on an hourly basis. The software required for the CMI system is being developed to be transferable so that programming costs to other users should be minimal although some reprogramming must always be done when programs developed elsewhere are implemented on a new computer. Instructor time to develop instructional objectives with learning materials and test items directly tied to them should be considered as a normal part of preparing and implementing effective instruction. Thus, the advent of effective CMI systems now make the possibility of self-paced, individualized instruction a reality within the framework of higher education. Again, the economy of scale must be large enough to justify incremental costs required to set up the CMI system.

- Intensify utilization of capital, e.g., by using buildings and equipment more fully

This solution has had many advocates who respond with dismay to the fact that classrooms, on the average, are utilized only about 60% of the time when school is in session, and school may be in session for only 3/4th of the year. Although this does appear to be less than optimal usage of buildings and space, capital outlay for buildings is usually only about 12% of the total budget. Balderston (15) points out, in an example to move the California system of higher education to year-round operation, that the costs of offering a curriculum and instruction are so much greater that it is difficult to realize any savings through more intensive use of buildings and space unless enrollments can be kept at capacity. When this was attempted in California, the attempt ultimately failed to reduce costs because an insufficient number of students took advantage of the year-round offerings. The net result was an increase rather than a decrease in costs. Once this was discovered, the year-round concept was abandoned. One of the lessons learned from this example is to keep an eye on the high cost areas such as instruction because they can easily mitigate or wipe out any savings which might accrue by trying to save money in a low cost area.

- Change curricular mix, e.g., by increasing enrollment in low-cost subjects (sociology) and by reducing it in high-cost subjects (physics)

This solution attempts to monitor and manipulate marginal costs. The implication is that the marginal cost, i.e., the cost of adding or producing an additional unit, is much greater in physics instruction than it is in another area such as sociology. Therefore, once optimal size enrollment is achieved in physics, it would be less costly to serve additional students if they were enrolled in low-cost courses such as sociology. It may well be that this solution strategy would achieve its greatest cost saving potential by looking at the SUS as a whole. This approach will be discussed further in one of the following sections.

- Reduce expenditures for noninstructional services

Stanford University provides us with an interesting example of how cost analysis can lead to decision making and cost reduction in the noninstructional student services area. Based on a unit cost analysis of counseling and advising, it was found that average institutional cost for personal or psychological counseling was $79 per hour, vocational counseling was $57 per hour, and academic advisement was $42 per hour. It was discovered that psychological counseling could be contracted with private practitioners in the community for $50 per hour and vocational counseling with private placement counselors for $10 per hour (16).

Thus counseling services could be provided to students through purchase of service arrangements at far less cost than by maintaining a full-time service on campus. However, pursuing this strategy assumes that such services would be available for purchase within the community where the college campus is located and that it would be at least as efficient and effective.

- Spread overhead costs by increasing the scale of operation

This strategy assumes that growth is a viable option. While this may or may not be true at the institutional level, it could be made to come true through consolidation of specific academic programs on a state-wide basis. For example, it has been pointed out that there are two graduate programs in oceanography in the state. Both are expensive to maintain. If both programs were consolidated in one location, this would reduce competition for students and eliminate duplication of expensive equipment and faculty.

Although this makes good sense from an economic perspective, it has serious political problems. Universities with on-going programs would be reluctant to turn them over to one of the other "more deserving" institutions. Yet statewide coordination of this nature would enable the creation of a critical mass of faculty and research facilities in one location that would be superior to what several institutions could achieve working separately. All students interested in particular field that has low enrollments would have to go to the same institution in that there would only be one offering of this particular academic program. The increase in cost-effectiveness through consolidation of academic programs on a statewide basis is compelling.

Oceanography is but one example. An analysis of existing graduate programs would be able to identify other potential areas where program consolidation in one or two locations could increase cost-effectiveness if the political problems could be managed and solved.

This concludes the list of recommendations compiled by Bowen and Douglas. However, there are some other alternatives that should be considered. Let's turn to them now.

- Reduce proliferation of courses

Proliferation of courses has been a traditional problem in higher education. Bender points out that proliferation increased during the 1950's and 1960's because of the relative affluence of colleges and universities (16). Not being hard pressed for operating funds, faculty pursued their academic interests and proceeded to incorporate them into the curriculum. The net result was an enriched curriculum with a variety of courses many of which are filled by only a few students. Although small classes are preferred by both faculty and students, they are difficult to justify on either a cost or an effectiveness basis.

We have seen an attempt to control course proliferation by a policy which requires a minimum enrollment in a course before it can be offered. It could well be that there is still a large amount of course duplication in certain academic areas such as research methods and statistics and others. Such duplication also creates the possibility for cost reduction through course consolidation within a given campus. However, the competition to enroll students in departmental courses to generate faculty FTE's would have to be replaced by a cooperative attitude and a willingness to be receptive to design curriculum objectives to meet student learning requirements from other academic disciplines as well as those from the department doing the instruction.

- Reduce the amount of time that it takes to serve students

In our review of the literature on the costs and effectiveness of technological applications, we found that instructional media which permit individualized instruction and self-pacing can reduce learner time by up to one third (12). Audiotutorial systems, programmed learning, and computer-managed instruction are three applications which have this potential. Thus, if registration procedures were such that students could enroll in an individualized course as soon as they completed a previous one, then students could accelerate their progress toward graduation. This assumes that a large share of the curriculum would be available in an individualized, self-paced format. Unfortunately, this is not the case although it would be a desirable goal.

Another means for accelerating student progress is through the use of credit-by-examination. This is also a viable approach if one is willing to accept the validity and utility of the instruments used to test students in order to grant credit.

- Reduce the size of the student populations to be served

This would be one of the quickest ways to control the size of the higher education budget. Regardless of increases in the state's population, colleges and universities would remain the same size and serve only a fixed number of students. Although this would be an "easy" solution to control costs that would increase through enrollment growth, it comes into conflict with the democratic ideal of equality of educational opportunity. How would decisions be made as to who should be admitted? Would the procedures be biased in favor of some and against other students from identifiable social class or ethnic groups? Will we find the "costs" of equal educational opportunity higher than we are willing or able to pay?

- Reduce faculty salaries

Although this alternative would have an immediate impact on cost reduction, it would arouse a great deal of resistance from the faculty members themselves. Now that they are unionized, the resistance could become formidable. One other side effect would be the impact that reduced faculty salaries would have on recruitment of new talent. Florida would be unable to attract top faculty talent if it could not offer to pay salaries which are competitive on a national level.

The other side of the coin must also be considered, however. In the face of tightening job markets in higher education, some faculty may have to choose between having a high salary or no salary at all. This could come about if fewer and fewer faculty were expected to become more productive in exchange for higher salaries. The higher productivity would be demanded by budgetary limitations. So colleagues would have to decide whether a large salary increase were worth the extra work that would be required in contrast to a lower salary which would allow a lower level of productivity as well as provide a job for a colleague. For example, when the City University of New York could no longer pay its bills, it closed its doors. In order to ease the financial crisis, the faculty union agreed to forego raises in order to open the university again. In this particular instance, there was no doubt that a financial exigency existed. It would be more difficult to argue in favor of reducing salaries if no financial exigency could be proven.

Capitalizing Front-End Costs

If cost reduction is to be achieved through applications of educational technology, it will be necessary to find funds to pay for:

- Design of delivery and management systems
- Design, development or purchase of instructional courseware
- Design, development or purchase of software and/or training procedures for management requirements
- Acquisition of required hardware

In higher education, the largest front-end costs will be in the areas of design and development of instructional courseware because there is so little of it available on the market. Investment costs for hardware will be greatest for "big media" such as computers and television. Relative costs for these technological applications are discussed in Chapter 3 of this report. Hardware for "little media" applications will cost substantially less but will be an incremental factor at the outset nonetheless.

In addition, it should be clear that no money will be saved if instructional media applications are inserted into the instructional program without other important changes. Unless dollars spent for faculty salaries are also reduced, then insertion of media becomes an add-on cost.

We have now identified two critical problems that must be dealt with:

- Raising capital funds to pay for front-end costs
- Reducing funds allocated to faculty salaries

In a way both problems could be attacked simultaneously. Reduction in the number of present faculty positions could create the funds necessary to pay for the front-end costs of educational technology. Once these are paid for, then these funds become true savings because the technological applications will be substituted to carry out the functions previously performed by faculty. The savings come about because capital equipment has lower recurring costs after it is purchased than labor intensive processes such as traditional instruction. So the key problem seems to be how to reduce the number of faculty positions to free up funds.

Assumptions about Enrollment Growth

Current enrollment projections by the DOE suggest that enrollment will increase between now and 1985. Community college enrollments are expected to grow by 73% and SUS enrollments by 41% (2). If this comes to pass, then the funds required to move into a capital intensive mode of education can be acquired by holding the present number of faculty positions constant while using new FTE generated funds for the purposes identified above. However, if projected growth does not materialize, then other means such as increased taxes or faculty layoffs will have to be considered.

Measuring Educational Output: A Missing Piece in the Puzzle

Several writers who have addressed the problem of educational productivity agree that we presently have no effective way to measure the value of educational outputs. They include economists such as Boulding (17), and educational systems analysts such as Wallhaus (6) and Hanushek (18). They also agree that our ability to understand and to improve educational effectiveness and efficiency will depend on finding suitable measures for the outcomes of higher education.

Hanushek (18) points out that the search for output indicators tends to be concentrated on measures that are readily available in institutions when the student is there in school. He also believes that there is little information with which one can judge the suitability of available measures. Hanushek raises concerns similar to those addressed by Hoyt (19) and by McClelland (20) regarding the lack of evidence supporting the assumed relationship between achievement in school and an individual's performance in society after graduation. In Hanushek's words:

> The real complication is that we do not have a very good understanding of how education is used in society, and particularly in the labor market. What is it that makes educated labor more valuable or more productive? If education is viewed as an intermediate good, its value--and the measure of output from the educational system--depends on its being used in other productive processes. Thus, to measure the output of schools, we have to concentrate on activities outside of schools (18, p. 26).

This position is similar to the one advocated by Kaufman (21). In his view, the overall goal for education should be that by the time the learner has finished school, s/he should be able to survive and contribute to society in at least an economic sense. However, present measures of higher education outcomes show little or no relationship with the value of education in an economic sense. Are there other alternatives for measuring educational output? Although it is much too early to judge their success, there appear to be two approaches to keep an eye on.

The first is the competency-based education movement which is now about four years old. Several liberal arts colleges have attempted to redesign their curriculum to conform to the competency-based concept. For example, there are projects at Mars Hill College, Alverno, and Sangamon State Univeristy. A competency-based approach was also attempted at Florida State University.

In a competency-based approach, instruction and assessment is focused on what learners should be able to do in order to be certified for graduation. This is in contrast to traditional education where the criterion for graduation is the accumulation of credit hours based on distribution requirements and a major area of study. The competency-based approach stresses explicitness and therefore both student and faculty accountability. The specified competencies are visible to all including employers because the competencies are listed on the transcript. Employers and others can then see what the student has learned to do. If there are gaps in required competencies for a specific area, then they can be readily identified by those who have an interest in what graduates should be able to do whether these interested parties be graduate school admissions committees or prospective employers.

Donald Hoyt (22) has prepared an analysis of the competency-based education movement in higher education and points out its virtues and its ambiguities. He concludes that it is too early to tell whether it will achieve improvements in effectiveness which its advocates claim. Yet competency-based education possesses the same characteristics which Drucker claims are necessary in order to move higher education from a budget-oriented enterprise to a performance-oriented one. On this basis, the competency movement should be given serious consideration as an approach for improving the effectiveness and efficiency of higher education.

The National Center for Higher Education Management Systems (NCHEMS) has also been wrestling with the problem of assessing the outputs of higher education (23). This group has attempted to prepare a set of procedures for documenting the outcomes of higher education in order to be able to study its productivity. The project has reached the field test stage; manuals describing procedures were circulated for review in late 1975. Progress since that time is unknown. It appears to us that the NCHEMS approach to measuring the outcomes of higher education follows a traditional view by looking at achievement measures and continued enrollment in higher education. There is also documentation of participation in community affairs as a measure of service. It also requires documentation of expenditure of an institution's funds within its community. Thus it appears to examine a number of academic and economic dimensions--dimensions related to the institution as a whole--rather than to look at what graduates are prepared to do and to contribute after graduation.

Needs assessment, as described by Kaufman (21), appears to be one of the few approaches which attempts to build in a close relationship between higher education's curriculum and the economic and citizenship demands which will be placed on the student after graduation. It should be noted that there are a number of other needs assessment formulations and models, but others do not reference system outputs to outcomes external to the educational system.

At this point the following question seems inescapable. What is the point of trying to become more efficient if we have no way to establish that higher education is effective?

Increasing Educational Effectiveness

In Peter Drucker's words, "Efficiency is doing things right. Effectiveness is doing the right things"; or, at least doing the "right things" so that important outcomes will result. It should be clear then, that any attempts to increase the effectiveness of higher education will ultimately require reassessing the goals and objectives of higher education.

We believe that any real breakthroughs in reducing educational costs will depend on a reassessment of the goals of higher education. As long as the goals of education are allowed to remain unexamined, Wingo argues that the only reform alternatives available to us are to:

- Reorganize
- Seek additional funding (24)

We can see that reorganization which fails to cut out irrelevant parts of the curriculum will neither increase effectiveness nor significantly reduce costs although some minor improvements in cost efficiency might be achieved. There is only one way to reduce costs and that is to stop spending money for something. Therefore, one of the most obvious ways to stop spending money for something is to cut out irrelevant parts of educational programs and to focus the remaining elements on achieving learning outcomes that have been validated against criteria external to the educational process.

There are technological means for reassessing the goals and objectives of education. One of the most useful procedures is known as needs assessment (21). The concept of need is defined as a discrepancy between the present state of affairs and a desired state of affairs. Because of the process-oriented nature of education, needs assessments have often focused on process gaps. An "alpha" needs assessment (25, 26), on the other hand, is intended to address learner outcome gaps rather than discrepancies in process. The basic requirements for an alpha needs assessment include:

- That needs be defined in terms of gaps in learner performance (i.e., be learning outcome-oriented);
- That all educational partners participate in identification and prioritization of needs (partners referring to students, implementers such as faculty and administrators, and parents and community members);
- That the relevance or usefulness of learning outcomes be judged against an external referent (i.e., those skills, knowledges, and attitudes required to survive and contribute to society after exit from college).

Once learner outcome gaps are identified the next step is to prioritize them by estimating the "cost" to remove each performance gap compared with the "cost" of ignoring it (21). In some cases the costs can be actual dollar figures (e.g., expenditures required to provide training in a specific competence area). In other cases the costs can only be inferred in terms of social and psychological factors such as quality of life, incidence of juvenile delinquency, vandalism, and other similar social indicators. Once needs are prioritized and "costed", then budget levels for program components can be calculated and decisions made regarding which components are essential for nurturing required survival and contribution skills. Program components which have been given low priorities can be eliminated from further consideration thereby setting the stage for significant cost reduction.

The needs assessment process sounds simple and rational and it is. The difficult part comes when needs are prioritized. This is the time when vested interests are threatened because their very existence is being considered. Any procedure which suggests that programs are to be evaluated and possibly eliminated usually arouses defensiveness and resistance--two natural human responses. In spite of this, the key to significant cost reduction will require that the value of each component of the curriculum be considered as a candidate for elimination. Otherwise, the potential for significant improvement in effectiveness and cost reduction will be lost.

Help Wanted: Solving a Three-Cornered Dilemma

Most colleges and universities aspire to satisfy the requirements demanded by the traditional missions of teaching, research, and service. As worthy as each mission is within itself, it creates tension and competition for time and resources when day-to-day operations are considered. The competition of time and resources is further heightened when taxpayers and legislators begin to state their values. For example, to insure that instruction take its proper place among faculty members' priorities, the state legislature has passed the "12 hour law" which mandates that all faculty are accountable for at least 12 hours of face-to-face contact with students per week. However, this requirement comes into conflict with the research mission of the university--time spent teaching is time taken away from the research laboratory, library, or typewriter.

Providing service to the state of Florida through consultation and dissemination of information seems justifiable. After all, the taxpayers are footing the bill for higher education, so shouldn't they expect to get something in return for this investment besides instruction for their children?

The problem, then, is one of maintaining a delicate balance between three competing missions. Conceptually the missions mutually reinforce each other; operationally they compete for the individual faculty member's time and the university's resources. Destroying a healthy balance presents real hazards to future progress. For example, research lays the foundation for progress, cultural change and technological innovations. To remove or reduce the research mission of the university would say that progress and improving the human condition is not worth investing in. Of course no thinking person would consider cutting out the teaching mission. On the other hand, an aggressive cost cutter might ask: Is it really necessary to teach so many subjects? We have too many teachers, so why prepare more? It's clear why courses in business and in science must be taught; the former are required to run the economy, the latter are required to create new technologies to make the economy more productive. But why do we teach foreign languages, and dead languages such as Latin? And why humanities and history of so many kinds and varieties? A glib answer would be that you don't have a respectable university without a full range of liberal arts areas. A more penetrating answer would be that the academic disciplines are different ways of looking at and understanding the world we live in. To remove the study of these academic disciplines would be to reduce our ability to know and understand the world. By doing so, we would reduce our ability to conceptualize and deal with problems that have been with man since the beginning of civilization. The net result would be to impoverish our cultural heritage and to remove the potential to improve on it. The ways of knowing would regress back to the level of folklore and mythology. We would also lose an important vehicle by which we can gain a vision of the finer things in life.

The point of this discussion is to draw attention to the complexity of the role which colleges and universities play in the growth and development of society. A failure to appreciate the delicate interplay of cultural transmission, cultural innovation, and utilitarian goals could reduce the overall effectiveness of higher education as we know it and block our attempts to improve it. Increasing effectiveness therefore, requires a balanced perspective between qualitative factors and costs. Although a philosophy of "cheapest is best" may be attractive in the short run, the possible long term effects could be as devastating as a replay of the dark ages.

It may well be that "cost-cutters" who display a disregard for the qualitative factors involved in this three-cornered dilemma provide at least some evidence for the lack of effectiveness of our present institutions of higher education. If poor decisions are made by college trained legislators and decision makers because they presumably failed to achieve the desired outcomes of a liberal education--which includes an appreciation for values other than those material--then who can the academics blame but themselves?

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EPILOGUE

The scenarios in Chapters 3, 4, and 6 may sound like dream worlds or fantasies to those who have labored long and hard in the vineyards of higher education. To be sure, wishing does not make such visions come true. On the other hand, every item that was described and discussed in these "success" stories is based in reality; such examples exist in real college and university classrooms today!

These scenarios have provided us with a glimpse of the future as "history". The purpose of writing such a "history" is to envision what the future might be like. And if we should come to like a particular vision of "history", then we can begin to plan and work to make it come true. So why don't we go ahead and do it now in Florida? Obviously there are several conditions which must be met in order for any of these visions to become a reality. Let's consider some of them.

Reassess educational goals and objectives. Curriculum is the means by which the goals and objectives of education are achieved. A curriculum which addresses inappropriate or irrelevant goals is likely to produce learning outcomes that will benefit neither learners nor the society in which they will work and live. It should be clear that a curriculum which addresses inappropriate or irrelevant goals can be neither effective nor efficient.

If Max Wingo (1)* is correct, we are our own worst enemies insofar as curriculum change is concerned. Educational essentialists believe that the present goals and objectives are the correct ones so there is little to be achieved by reassessing them. If we are essentialist in our educational philosophy, then we will have great reluctance to actively engage in an externally-referenced needs assessment (6).

The technology of needs assessment is available and it works--that is if we are willing to make it work. So the first necessary condition is to be willing to spend the time and the effort required to determine which of our present goals and objectives are still useful and to identify new ones in order to prepare our youth to live in a world which will no doubt be very different from the one we have experienced during our own lifetime.

Create incentives for change. Writers such as Boulding (2) and Pincus (3) have pointed out that there are few if any incentives to motivate educators to adopt new procedures or effectiveness increasing strategies which are likely to save money. This comes about for two reasons. One is due to the nature of service "industries", the other to the nature of the budget allocation process itself.

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*Numbers in parenthesis ( ) refer to references which document sources of quotations. A complete list of supporting documents can be found at the end of this epilogue.

First of all, in a service industry such as education, "efficient and effective" management usually means control of cost. Being paid out of a budget allocation usually changes what is meant by performance. Effective "performance" in a budget-based institution usually means a larger budget. In business, customer satisfaction is the basis for assuring performance and results. In contrast, "customers" of education have at best only an indirect influence over the allocation and utilization of funds regardless of the level of satisfaction. In a sense, education is endowed with monopolistic powers. The "customers" have little choice regarding demands for better service. Taxpayers pay for education whether or not they want the services provided by it (4).

Secondly, the budgeting process itself provides few incentives for cost reduction. It is common practice for administrators to propose inflated budgets in order to be able to receive at least as much as was obtained during the previous year. Once the allocation is received, efforts are made to be certain that all funds are expended by the close of the fiscal year. Otherwise, surplus funds will be "swept" by the central office. If surpluses are found too frequently, then the college or department is usually in for a budget cut the ensuing year.

As long as education is conceived of and operated as a budget-driven (rather than a learner-driven) process, it will be difficult (if not impossible) to create incentive systems that will result in significant cost reduction and increased learner achievement. As pointed out in Chapter 8, effectiveness and efficiency are tightly intertwined and can only be studied and understood in terms of educational output, i.e., student performance. It should also be clear that judgments regarding accountability are intertwined with effectiveness and efficiency and must also be linked to indicators of performance. Therefore, any incentive systems that are intended to increase effectiveness, efficiency, and accountability must be related to student performance. Otherwise, education will become, in Boulding's (2) words, "a pathological sector of the American economy."

Conditions necessary to derive maximum benefits from educational technology. Let's recapitulate this issue by listing and then examining conditions under which maximum benefits can be realized from educational technology. These conditions include:

- Create an effective planning capability (5,7)
- Create an effective management capability (5)
- Create an effective means for monitoring the effectiveness and efficiency of instructional programs (5,7)
- Shift the emphasis from an instructional process orientation to a learning outcome orientation (5,7)

Let's look at each one in turn.

Regarding planning capabilities. Implementing significant cost reduction strategies will require kinds of planning and design that colleges and universities have not ordinarily been accustomed to nor accomplished. Cost reduction procedures, in turn, will require having to make changes that students, professors, administrators, and the public have also not been accustomed to. All educational partners--students, professors, and the public--will have to be "educated" to accept deep change. Planning plays a key role in this. Planning will take on some new dimensions if we are to be successful. Not only will there have to be planning to accomplish better that which currently goes on in colleges and universities, but additionally, educators will have to start looking at the requirements for determining what current skills, knowledges, and attitudes and what future skills, knowledges and attitudes will be required of learners when they legally leave the campus. This will involve both an "internal" and "external" view of education and educational planning (6).

Adoption of newly developed instructional materials and procedures which show a potential for increasing efficiency and effectiveness will be an important step. We don't have enough time and money to allow each faculty member to design and develop each element of curriculum de novo. Professors will have to be retrained to adapt available materials and procedures for local needs. Planning and design will play a key role in implementing new, more cost-effective methods and means.

Regarding management capabilities. More efficient use of existing resources will require more effective management and coordination within each department and each college. Higher education managers who once held an almost absolute authority over professors now find this authority being eroded by collective bargaining and faculty unions. If new curricula and new learning systems are adopted, then professors will have to become better managers too. Simply running a traditional instructional program will not be good enough. If professors are to be held accountable for results based on specified learning outcomes and exit standards, then student achievement that is below performance standards will become the focus of systematic inquiry to determine how to raise learner performance to required levels--another task for which higher education managers will have to assume responsibility. There is little question that significant cost reducation strategies will require structural change. Effective coordination, leadership, and human relations skills will be critical factors in the management of the deep change that will be required.

Regarding monitoring the effectiveness of instructional programs. The effectiveness and efficiency of educational programs cannot be systematically increased without some way to monitor learner performance. As Hanushek (8) has pointed out, we presently have no effective means for measuring educational outcomes. Therefore, effects produced by changes in resource allocation patterns or changes in technology cannot be detected, evaluated, and required adjustments made. This, then, brings us to perhaps the single most important requirement in order to derive full benefit from applications of educational technology--moving to an emphasis which is learner outcome based.

Regarding a shift from teacher-oriented to learning outcome-oriented-education. If reassessing the goals of public education seems difficult, then shifting from a teaching-centered concept of education to a learning-centered one may seem well nigh impossible. Although this may be an overstatement, it is intended to point out the difficulty of uprooting a set of beliefs about the way education has been done for centuries. These beliefs will have to be replaced with concepts that *appear* to be radically new and different. What is actually involved is a shift in point of view.

Education will probably not change or improve very much as long as we believe that professors must "teach". The fallacy of believing that professors must "teach" is that teaching may have little or nothing to do with whether learners learn. Learning is something that happens *inside* of learners. So isn't it about time that we began to design classrooms as *learning* environments and to establish what we want learners to be able to *do* rather than to begin--one more time--by saying what professors will "teach"?

Well then, if we shift from teaching to learning, what will we do with the faculty? Given such a shift, faculty will have just as much, if not more, to do and it will be much more intellectually and individually satisfying. They will be expected to motivate learners to achieve new and more intellectually satisfying outcomes. It may even come to pass that professors will finally be given an opportunity to do what only human beings can do--humanize and socialize other human beings. At the present time, professors are so busy presenting information and correcting tests that there is precious little time to socialize and humanize students. The rationale for substituting technological applications for human teachers would be to free them to do what only humans are capable of doing. Will it come to pass that by considering how people and machines can work together to educate the young, that we will discover what is unique about being human? This is not likely to happen as long as professors teach toward unquestioned (and perhaps outdated) goals while using instructional methods which promote the development of passive, information-saturated learners.

Placing emphasis on student learning outcomes is one of the most effective launching points for educational improvement and is pivotal for helping educational institutions to change for the better. Writers such as Drucker (4) seriously question whether an organization such as a college or university can sensibly decide between one course of action or another if it does not first understand the kinds of outcomes it seeks to achieve. However, even well-intentioned educators will have to be prepared to deal with the pitfalls that are commonly encountered when learning outcomes are considered. These pitfalls include:

- Difficulty in attaining agreement about the outcomes

- Difficulty in assessing whether the outcomes have been achieved.

As pointed out in several of the earlier chapters, present measures of achievement are of dubious value. They will have even less value as new kinds of learning outcomes are determined by externally referenced needs assessment (6) and incorporated into the curriculum.

Regarding the distinction between technological processes and technological applications. Now that we have reviewed these six basic conditions, let's come back to reanalyzing the relationship between technology as process versus technology as hardware applications. An examination of the contents of Table 1 on the next two pages will facilitate this analysis.

As can be seen in Table 1, the problem solving and design processes are prerequisites to implementation of instruction regardless of whether the instructional procedures are hardware-based or not. If we attempt to approach educational problems systematically, it follows that the process side of educational technology will have its greatest relevance in identifying problems from needs (Step 1.0), in determining solution requirements and solution alternatives (Step 2.0), and in selecting solution strategies (Step 3.0) because there have been no known instances where hardware equipment has been able to accomplish these tasks. These steps can be best accomplished through the use of informed human judgment based on a rational determination of and analysis of values, resources, and desired outcomes.

As long as educational technology is equated with hardware applications such as television and computers, we are likely to begin our educational problem solving at Step 3.0 (select solution strategy). This is unfortunate because selection of instructional hardware in the absence of other important considerations such as knowing specifically what learners should be able to do that they presently can not do, is likely to fail because the hardware is a potentially useful solution being applied to the wrong problem!

Careful analysis of Table 1 shows that instructional hardware becomes relevant only after we reach Step 3.0 (select solution strategy) whereas technology as a problem solving and design process is evident in almost every facet of educational problem solving. It should be clear that the more generally useful facet of educational technology is inherent in the process side and is therefore a more strategic element in working out cost reduction procedures. We, therefore, urge the readers of this report to place greater reliance on technology as process rather than on technological hardware applications. By keeping these two facets in proper perspective, we are much less likely to choose solutions to the wrong problems as has been true in the past.

Panaceas, technology, and reality. When one considers the conditions that have been identified above, it should be clear that there are no panaceas or easy solutions to be found in technology. Although educational technology provides concepts and tools that can help us to improve education, achieving this will require soul searching and contemplation of doing things in ways to which we are not accustomed. Educational technology will work for those who are committed to using

Table 1

RELATIONSHIPS BETWEEN PROBLEM SOLVING, EDUCATIONAL TECHNOLOGY AS A PROCESS, AND TECHNOLOGICAL APPLICATIONS

A Problem Solving Process[a]	Technology as Problem Solving and Design	Technology as Hardware Applications
1.0 Identify problem (from needs)	Plan programs based on identified learner needs, needs of educators, and needs of society both currently and in the future	(There are no known instances of hardware equipment that can effectively accomplish this task)
2.0 Determine solution requirements and solution alternatives	Identify detailed performance requirements and identify possible ways and means to meet the verified needs	(There are no known instances of hardware equipment that can effectively accomplish this task)
3.0 Select solution strategy	Select the most effective and efficient ways and means to meet the verified needs	(There have been attempts to develop algorithms for media selection but they have not been as effective as informed human judgment)
4.0 Implement solution strategy	Design curriculum which is learning outcome oriented and directly related to needs identified in step 1.0	(There are no known instances of hardware equipment that can effectively accomplish this task)
	Design instructional delivery procedures	Use hardware-based instructional delivery systems such as ITV, radio, computers, etc., if deemed effective and efficient, otherwise use human and other nonhardware resources

	Design procedures to monitor learner performance	Use test scoring machines, computer-managed data files, etc., if deemed effective and efficient, otherwise use human and other nonhardware resources
	Design management procedures to implement and to coordinate all of the above	Use computer-based management information systems if deemed effective and efficient, otherwise use human and other nonhardware resources
	Design and implement procedures to determine the effectiveness and efficiency of solution strategies in meeting identified needs	Use test scoring machines and computers to reduce data, computerized files to store data
5.0 Determine performance effectiveness	Evaluate the effectiveness and efficiency of the resources, curriculum, plan, programs and personnel	Use computer-based data analysis programs to analyze performance and cost data. Use human judgment to determine worth and to make decisions
6.0 Revise as required	Design and install methods, and procedures that will remove gaps observed in learner performance and/or increase efficiency of program operations	(There are no known instances of hardware equipment that can effectively accomplish this task)

rational processes to achieve clearly identified, useful ends. Short of that kind of commitment, we may have to settle for whatever fate chooses to give us.

A Concluding Note

Academics in higher education can stand around, wring their hands, and bemoan the ordeal. If they do only that, they will be the victims of change and will reap the harvest of frustration, anger, lack of feelings of worth, of self-fulfillment, and of contribution to society. Or, they can become active participants in change, and help manage it to a successful, fruitful and rewarding enterprise -- an enterprise which will be responsive and responsible to learners and to society.

If we continue to react to situational crises, then we will be committing to change by reaction. If we begin to forge a new future based upon helping learners to survive and contribute (6) and to plan for individual success in a world of today and tomorrow, then we will see a success for learners, and a success for our institutions of higher learning -- they will be valued and valuable since they will be delivering a set of persons who are caring, confident, and competent.

Colleges and universities are judged when learners reach the point of exit into society. If we turn out people who cannot read, write, or relate, we will be known as failures. If we turn out the opposite, then we will be accepted and nurtured.

Higher education must start to act, to become a part of the society and a part of the political process. We have to start thinking of the whole human being, not just thinking of an individual absorbing knowledge in fragments and pieces, knowing this differential equation, or that historical fact. The learner must be whole, functional, and desire continuing growth -- and that does not happen by accident or by continuing the same old business in the same old way. We can no longer afford to put the same old wine in new bottles and just change the label.

A new way must be forged. We must preserve what is currently functional and helpful, drop the non-functional, and build new pathways to success. This can be done through "soft technology" -- by planning for success. After specifications for success are set and accepted, then we can apply the "hard" technology of both "big" media and "little" media to achieve these successes. It is not "this technology" or "that technology" which is important here, it is the way in which technology as a process (soft) can identify useful and functional technology as equipment and materials (hard) to achieve new and viable successes.

Yes, technology can save us money -- nickels and dimes if we only use the conventional concept of technology as "things." We can save megabucks and lives with the newer concept of technology as a process for making education functional, useful and exciting. The choice is ours.

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Appendix

AN ECONOMIC MODEL FOR RESOURCE ALLOCATION IN EDUCATION

by

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Purpose of this Paper

In this paper we present some economic tools as applied to education. For any output, be it a service or a commodity, a production function describes the relationship between the various inputs and the maximum quantity of the output that can be produced in a given time period. In the traditional higher education system the inputs might be one teacher, one classroom, one blackboard, desks, chairs and books which produce an output: education. Presumably, the education is of higher quality the lower the number of students per teacher. However, this single process or combination of inputs is not necessarily the only combination or the best one for all times. At one extreme is one teacher per one pupil all day. This extreme is no more realistic or practical than another extreme of, say, one computer terminal and one pupil for all day. The actual combination of teacher and other inputs is somewhere between extremes and the best or most efficient combination of inputs is also somewhere between the extremes. The actual and the best combination of inputs are not necessarily the same but if they are today, they may not be next year.

A production function assumes a given "state of the art" in technology (1).* If a new process or piece of hardware becomes available it may be possible to produce the same output with less money or it may be possible to produce a larger or better output for the same amount using the new technology. Keeping the same proportion of inputs would then imply an inefficient combination of available inputs.

The Isoquant as a Simple Analytic Tool

Economists distinguish a particular production process from the set of processes that exist as the output of a particular good increases. At any given level of output, several alternative combinations of inputs may be used in the production of that output. These are depicted by an isoquant which is a curve that connects a series of points, all representing the same output level. Some of these may be inefficient in the sense that under any reasonable set of resource-price combinations, a greater output may be obtained through a different resource combination at the same price. One, or several, production processes may be efficient in the sense that for a given price, no other resource combination can make a larger contribution to output. Which particular set of efficient inputs is selected will then depend on the prices of the inputs.

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*Numbers in parenthesis ( ) refer to references which document sources on which this paper is based. A complete list of these references can be found at the end of this appendix.

A production function shows the maximum amount of output that can be obtained for any specified set of resource combinations. Traditionally, such a function is specified with labor and capital variables but nothing precludes the inclusion of a variable to represent technology. It is process free in the sense that the function recognizes any given resource combination as desirable, solely for its effect on output. Thus, choices based on past tradition, on circumstances, or on other non-production oriented criteria are neither favored nor disfavored. Once a production function is identified for a particular industry, it is possible to distinguish from an almost infinite number of alternative processes those which maximize output for different price ratios of inputs.

The nature of a production function may be best understood with reference to a set of outcomes. For the moment we shall ignore the question of what the output is or the possibility of multiple outputs, since our goal is to explore several basic hypotheses.

Figure 1 provides an example. On the vertical axis are the capital expenditures made on higher education. The length of this axis is limited by the total units of capital available to a college or university. On the horizontal axis are the total units of teacher labor available to an institution. Again, the axis is limited to the total supply. The curves, $Q_1 \ldots Q_2 \ldots Q_3$, represent different levels of educational output. Thus, if curve Q_2 denotes the total output of a college with 150 students, the resources combinations denoted by points A, B, and C produce an output of 150. Any point lying on Q_2 by definition produces the same output. The curves are convex to the origin to denote the diminishing marginal returns to the inputs that occur if more of a particular commodity is employed. A movement out from the origin (O) denotes an increase in output. Thus Q_1 is less than Q_2 and Q_3 is greater. What these curves enable us to do is to relate combinations of resources to various outputs in a visual manner.

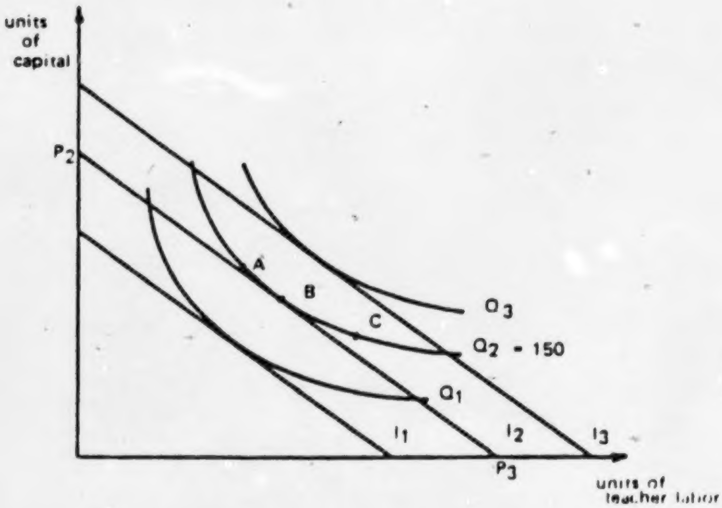

Figure 1. Optimal input combination to maximize output with a given budget.

The lines, I_1...I_2...I_3, represent different budget levels. If budget amount I_2 was available it could all be spent on teacher inputs at P_3 or all on capital inputs at P_2. The budget line represents all the possible combinations of inputs that could be purchased with a given budget level. The slope of the budget line is determined by the ratio of the input prices, i.e., the relative prices (1). The relative prices are important because a change in the price of one input relative to another provides a new combination of inputs available for the given budget. This is seen in Figure 2.

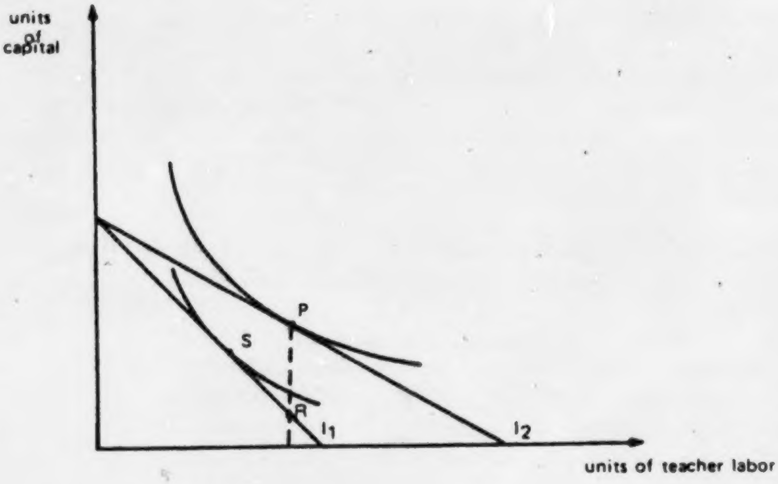

Figure 2. Optimum output with a changing input price.

As an example suppose that through collective bargaining instructors succeed in raising their salaries. For simplicity, assume that the price of other inputs is unaffected. In the diagram, the budget line I now shifts to I_1, denoting the fact that fewer teacher inputs can be purchased with a given budget. The initial optimal input combination was at point P. If the same amount of teacher input is purchased, point R will then represent the new combination of inputs. This is not the most efficient combination, however. If teachers can be readily substituted for other inputs, and vice versa, the rise in the price of teacher inputs is likely to induce a substitution of other inputs for teaching inputs. There will be a movement toward point S which, given the change in relative prices, will now represent the most efficient combination of inputs at the new price ratio. There are two problems with the above: (i) the outputs change over time (or should); (ii) it assumes homogeneous inputs within a class, (e.g. teachers).

To the extent that employers are not free to substitute other inputs for teachers, due to political, legal, and other constraints, what this analysis suggests is that education will be produced at less efficient output levels than could be attained in the absence of these constraints. Efficiency can be achieved in this context by promoting flexibility in the allocation of resources by the introduction of an external subsidy that returns the college or university to point P, or by a shift in the productivity of teachers which would be likely to return the institution to point P only by accident.

The simple analysis presented above has several implications of importance to the work that follows. First, it is clear that a large (if not infinite) number of resource combinations can be used to produce a given level of output. This is denoted by the fact that the production curves are continuous. Where a number of inputs are involved, the range of combinations available to produce a given output will increase dramatically. Second, the optimum combination of resources is not independent of the price of the resources employed in producing a given good or service; what may be optimum under one set of prices need not be optimum under another. Changes in price of teachers due to inflation, labor negotiations, or other economic factors, are liable to move an institution either closer or further away from the efficient point of operation. Thus, it is impossible to specify a single efficient combination of resources (or a single teaching process) that will be applicable through time. What is efficient this year may be rendered inefficient next year by changing relative prices. In this sense, the realities of economics must come into clash with an educational process that mandates stability of input combinations.

The Efficient Combination and Economies of Scale

If a single production process can be found, we can specify the exact proportion of each input for any given level of output. Before suggesting such a process we must be aware of the limitations. Therefore, we once again begin with a set of output curves, as shown in Figure 3.

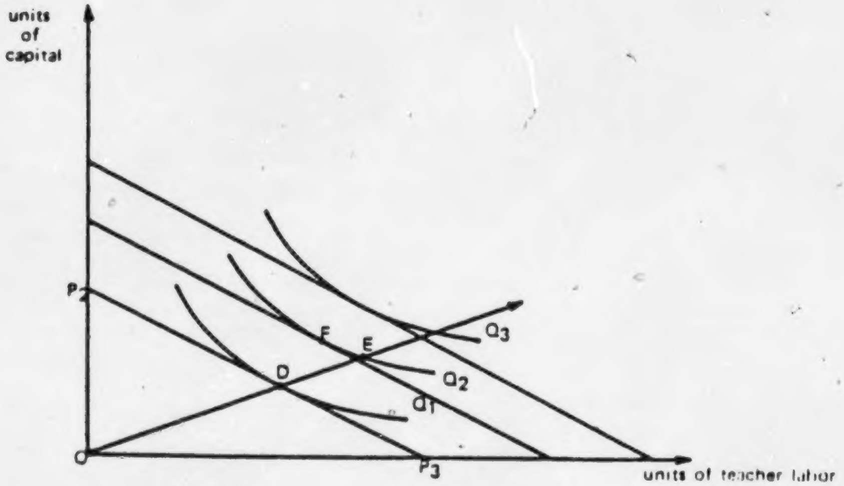

Figure 3. Expanding output with fixed proportion inputs.

Suppose we assume either a fixed teacher/capital ratio or one which remains reasonably fixed. Suppose too that the amount received is on a per student basis. The line OR in Figure 3 then shows one possible production process (3). For each output level ($Q_1 \ldots Q_2 \ldots Q_3 \ldots$) a fixed proportion of teaching inputs to other inputs is denoted by the line OR. This line should be the set of all points for the given input ratio at various output levels.

Now suppose that at output level Q_1 with price ratio P_3/P_2, the efficient combination of teaching resources to capital resources is given at point D. For illustration, let this equal 2 hours of teaching time to 1 hour of computer managed instruction. Now assume that an influx of new students into the classroom requires a boost in the level of output of educational services to Q_2. At this output, the input combination is at point E for the given process (i.e., 4 hours of teaching time and 2 hours of CMI) which is not on curve Q_2. But the optimal combination is at point F (e.g., 3 hours of teaching time and 1½ hours of CMI and 1 hour of Programmed Instruction). In this case an increase in output results in a change in the efficient resource combination.

This analysis again has important implications for the community colleges and universities as the following example illustrates. A small institution is likely to have comparatively few physical education students. The school can allocate a certain percentage of its per student receipts for physical education teachers and equipment but the outlay is likely to be small. Thus, it may build and maintain one ball field and hire one P.E. teacher. In contrast, a larger college with more students taking physical education can hire more teachers and perhaps build and maintain a ball field, a gymnasium, and a tennis court. In this instance, size permits diversification of function.

What a school can do as its output level grows depends on whether it is constrained to a single production process. If the school is limited to a fixed set of inputs, say it can only add one teacher if it adds one ball field, it may choose a less optimal output than it would choose if it could use its funds freely.

Does Each Person Have His or Her Own Production Function?

A further aspect of the educational process that complicates measurement is the fact that different students may receive different benefits regardless of the emphasis of the school. One student may learn how to achieve high grades and high test scores; one may learn to get along very well with people or to deal with the public; another to develop vocational skills. The existence of differential gains in "output" among the several dimensions of learning means that the efficiency of an educational system should be measured in terms of several measures. But this involves a weighting issue. If all outcomes are given equal weight, it is possible that a school will be judged equally successful if it teaches reading, or yoga, spelling or literature, physical education or chemistry. Since some of these skills are less costly to teach than others, the election of efficiency as a guiding goal implies a shift toward the less costly subjects.

Alternatively, if weights are established, this will give rise to two problems. First, there is a question of who is to select the weights and what criteria are to be used. Work by Arrow (2) and others suggests the serious problems such a procedure introduces. Second, the weights finally chosen are not likely to be independent of the cost of the outputs. As the relative costs of alternative outputs change, so too may the desired output set.

Finally, to the extent that educational outputs are both long-range and contingent on a number of steps in the educational process, judgments made about the outputs of a particular process are likely to be suspect. This is because some of the outcomes will not be accurately reflected by evaluating a student immediately after his formal education is completed.

Multiple Outputs and their Impact

The problem is further compounded by the likelihood that the outcomes of the educational system are multiple (4). The problems in identifying the outcomes in the example are indicative of the problems in identifying the multiple outcomes in other educational areas. Physical education activities are a source of exercise, of knowledge, of how to utilize one's body in a constructive manner, of a cooperative and/or competitive spirit, and of sportsman-like attitudes. It may also be complementary to other forms of education if it helps students to think more clearly. The process of identification and definition of the outcomes of physical education is neither a simple nor a precise one. But other educational areas are possibly even more difficult to define in this respect. In addition, there is some disagreement on what higher education is or what students should gain from a college education.

Some argue that higher education should transmit knowledge; others see its major purpose as socialization and selection. This suggests that if colleges and universities differ in the outcomes they stress, empirical attempts to identify a production function will be blocked by both a lack of information on which ouputs are being stressed and by disagreement as to how these outputs should be quantified.

The intangible outcomes of education also compound the problem. Sportsmanship and a positive attitude are two, citizenship another. A very important outcome is the development of analytical ability. A student not only assimilates the material he is presented with but ideally he learns to analyze it to arrive at an understanding and rational use of it. It may also reflect the fact that what we wish education to accomplish for an individual may be different for different stages of that person's life.

Implications of the Above Analysis for Measurement of Outcomes

What these considerations seem to suggest is that the evaluation of alternative educational processes is necessarily hazardous and crude. At best, it may be possible to identify a process that moves us toward the optimal production point without saying how close we come. This might be done by determining whether the student can obtain the same material in the same time but for less resource cost, or whether s/he can reach higher levels of understanding in the same time and with the same resource cost. Of course, it is also possible that particular students may learn more, in less time, and using fewer resources. But for evaluation purposes it is useful to consider these as separable outcomes. Table 1 shows the set of outcomes in the form of a matrix.

Table 1

Evaluation of Alternative Outcomes

		Educational Outcomes	
		The Same	Improved
Cost Inputs	Same time	O^{s}_{t}	$O^{s'}_{t}$
Time	Less time	$O^{s}_{t'}$	$O^{s'}_{t'}$
Other Inputs	Same other inputs	O^{s}_{I}	$O^{s'}_{I}$
	Lesser amounts of inputs	$O^{s}_{I'}$	$O^{s'}_{I'}$

Other things being equal, O^{s}_{t} and O^{s}_{I} would suggest no improvement. Outcomes $O^{s}_{t'}$ and $O^{s}_{I'}$ denote a saving of student and public resources respectively while $O_{t}^{s'}$ and $O^{s'}_{I}$ suggest that with the same cost inputs, educational outcomes are improved by a change in process. Finally $O^{s'}_{t'}$ and $O^{s'}_{I'}$ denote both a rise in effectiveness and decrease in input requirements with the different process. This classification scheme can be used to evaluate the impact of alternative processes.

Because educational outcomes are not well-defined, evaluation of the alternative combinations of resources is difficult. This leads to several measurement problems also. First, the existing combination of resources cannot easily be proven to be optimal (i.e., at the tangency of the isoquant and the relative price line). Since this combination is usually well-entrenched in higher education, the presumption is that clear cut improvements should be established or a financial crisis must be imminent before a change can occur. Second, in the absence of a widely accepted set of evaluation criteria by which alternative combinations can be judged, it is difficult to limit the range of resource combinations that a college or university considers. Presumably needs assessment provides one way in which evaluation criteria can be established. The difficulty lies with specifying in some detail how outcomes ought to be measured.

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